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the ACCOUNTING REVIEW

Quarterly Journal of the
AMERICAN ACCOUNTING ASSOCIATION

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Budget-Based Compensation and Discretionary Spending

William R. Baber

ABSTRACT: Budget-based compensation arrangements often are used in decentralized organizations to motivate manager decision-makers toward achieving organizational objectives. The use of budgets for this purpose can influence managers' decisions to make discretionary expenditures that yield future benefits. This study analyzes how budget-based compensation influences these decisions. The primary insight is that, if a lump-sum bonus is paid for meeting budgets, then managers prefer more discretionary expenditures when budgets are set at levels relatively difficult to achieve than when budgets are at levels easily attained.

1. INTRODUCTION

THIS study analyzes decisions to make discretionary expenditures when the manager receives a lump-sum reward if actual costs are less than budgeted costs. More precisely, the analysis contrasts how tight budgets—defined as budgets set below the mode of the expected distribution of operating costs—versus loose budgets—budgets that exceed the mode of the expected distribution—influence the manager's incentives to make current (period 1) discretionary expenditures that yield future (period 2) operating cost savings. The primary insight is that, for decisions that conform to assumptions which are summarized below, the manager is more likely to make such expenditures when budgets are tight than when budgets are loose.

Assumptions about both the operating costs and the manager's compensation are required to obtain this insight. In particular, the distributions of current and future operating costs are independent, uni-modal, and either identical or symmetrical with equal expectation, and both the proposed expenditure and the related savings are known with certainty. Regarding compensation, the manager is guaranteed in each period a reservation wage plus a bonus when total costs, which are discretionary costs plus operating costs, do not exceed the budgeted amount. Thus, the manager neither quits nor is dismissed and both the proposed expenditure and the related future benefit affect the manager's expected compensation. In addition, the parameters of the compensation arrangement—that is, the budget and bonus amounts—are specified prior to the expenditure decision and are identical for both periods.

Situations with many of these characteristics are common in practice (for

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The author thanks James Ohlson, Pradyot Sen, Gordon Shillinglaw, and two anonymous reviewers for their helpful comments. Funding for this study was provided by the Columbia University Graduate School of Business.

William R. Baber is a Visiting Assistant Professor of Accounting, Duke University, on leave from Columbia University.

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example, see Sasser and Pettway [1974]). To illustrate the implications of the study, Lawler and Rhode [1976, p. 70] cite evidence that tight budgets, set at attainable levels, motivate managers to achieve the organization's financial objectives. Others note that using budgets or similar financial control techniques to motivate managers induces a preoccupation with meeting current objectives and thus discourages investments that yield future benefits (e.g., Stata and Maidique [1980, p. 157]; Hayes and Abernathy [1980, p. 70]). Analysis offered in this study suggests that, by tying compensation to both current and future results, top-level managers can use budgets to motivate managers and, at the same time, encourage rather than discourage discretionary investment.

Two points of clarification should be noted at the outset. First, the analysis does not imply that invoking tight budgets, or a specific tight budget, fosters optimal expenditure decisions, or even decisions more consistent with the organization's (owner's) financial objectives. In particular, expenditures made under a tight, but not a loose budget (or under no budget), may yield returns less than the organization's marginal cost of capital. Identifying optimal compensation arrangements requires considering owner, as well as manager, preferences; such problems are best addressed using an agency paradigm [Baiman, 1982, pp. 198–9]. Second, the result only contrasts tight and loose budgets and does not imply that tightening (loosening) budgets expands (contracts) the set of expenditures preferred by managers. On the contrary, the analysis suggests that budgets that are either too easily attainable or not attainable discourage expenditures that yield future benefits. Thus, this study generally supports the maxim that budgets should be set at tight, yet attainable, levels [Shillinglaw, 1982, pp. 696–8].

The presentation is organized into four additional sections. Section 2 offers a general rule to guide expenditure decisions when the decision-maker's compensation depends on both current and future controllable costs. Lump-sum budget-based compensation is introduced in section 3. The analysis reveals that, given this compensation arrangement, all rational decision-makers evaluate expenditure decisions by comparing discounted probabilities derived from expected current and future distributions of operating costs. To explore further how budgets influence expenditure decisions, assumptions about the distributions of operating costs are invoked in section 4. The formal result is that, given these assumptions, every expenditure preferred under a loose budget is also preferred under some tight budget. In addition, section 4 illustrates graphically the practical implications of this result. Section 5 summarizes the critical assumptions and reviews the insights obtained.

2. GENERAL CHARACTERIZATION OF THE DISCRETIONARY EXPENDITURE DECISION

To begin, assume that the consequences of discretionary expenditures can be modeled using a two-period framework where a proposed expenditure in period 1 yields cost savings in period 2. In particular, a manager decides whether or not to spend discretionary costs $e_1>0$ in period 1 which saves operating costs $e_2>0$ in period 2. More formally, the manager selects an action a_k, where

$a_1 \equiv$ spend e_1 in period 1 and save e_2 in period 2, and

$a_2 \equiv$ do not spend e_1 and incur e_2 in period 2.

TABLE 1

OPERATING COSTS IN PERIOD i FOR a_k

	Operating Costs in: period 1	*Operating Costs in:* period 2
a_1 (make expenditure)	c_1+e_1	c_2-e_2
a_2 (do not make expenditure)	c_1	c_2

Observe that the period 2 cost savings e_2 can be greater or less than the period 1 expenditure e_1; that is, the pair (e_1, e_2) need not be a positive net present value investment. Let the operating costs c_i be the costs in period i when the manager does not make the proposed expenditure.

Table 1 shows how costs for both periods depend on the manager's action a_k. If the manager makes the expenditure (selects a_1), then total period 1 costs are what they would be without the expenditure (c_1) plus the amount spent (e_1), and total period 2 costs are what they would be without the expenditure (c_2) less the amount saved (e_2) by spending e_1 in period 1. If the manager does not make the expenditure (selects a_2), then the costs are c_i in period i.

Assume that the manager is uncertain about the costs c_i, which are independent of a_k, but knows the amounts e_i. Specifically, let the probability density function $p_i(x)$ represent the manager's assessment of the probabilities that, disregarding e_i, costs $x=c_i$ accrue in period i.

Suppose now that the manager receives compensation that depends in part on the total costs that accrue during the period.[1] In particular, at the end of each period, the manager receives and consumes compensation $b(x)$ when costs are x. Assume that $b(x)$ is weakly decreasing in x—that is, $b(x+e) \leq b(x) \leq b(x-e)$ for $e>0$.

When choosing a_k, the manager acts to maximize total expected utility $U(a_k)$ which is separable and additive in period 1 and 2 utility. Let $u[b(x)]$ represent the manager's utility for compensation in either period, and assume that utility is strictly increasing in $b(x)$. Although the same utility function applies for both periods, period 1 compensation is preferred to period 2 compensation in that the manager discounts period 2 utility by a factor $0<\alpha<1$. Hence, given that c_1 and c_2 are independent, if the manager makes the expenditure (chooses a_1), then

$$U(a_1)=\int_{c_1} u[b(c_1+e_1)]p_1(c_1)dc_1 + \alpha \int_{c_2} u[b(c_2-e_2)]p_2(c_2)dc_2, \quad (1)$$

and if the manager does not make the expenditure (chooses a_2), then

$$U(a_2)=\int_{c_1} u[b(c_1)]p_1(c_1)dc_1 + \alpha \int_{c_2} u[b(c_2)]p_2(c_2)dc_2. \quad (2)$$

Since the manager maximizes total utility, making the expenditure (choosing a_1) is strictly preferred when $U(a_1)>U(a_2)$, or when

$$\int_{c_1} \{u[b(c_1)]-u[b(c_1+e_1)]\}p_1(c_1)dc_1 < \alpha \int_{c_2} \{u[b(c_2-e_2)] - u[b(c_2)]\}p_2(c_2)dc_2. \quad (3)$$

---

[1] The analysis assumes a decentralized decision setting such that total costs in each period, but not the partitions c_i and e_i, are observed jointly by managers and their superiors. This precludes establishing separate budgets

The decision rule given by expression (3) states that, if the reduction in expected period 1 utility from spending e_1 in period 1 (the left side of the inequality) is less than the increase in discounted expected period 2 utility from saving e_2 in period 2 (the right side of the inequality), then making the expenditure (a_1) is preferred; otherwise, not making the expenditure (a_2) is preferred. Note that, since compensation is weakly decreasing in costs and utility is strictly increasing in compensation, spending e_1 never increases, but may decrease, period 1 utility and saving e_2 never decreases, but may increase, period 2 utility.

3. EXPENDITURE DECISIONS FOR BUDGET-BASED COMPENSATION

Consider now an arrangement where period i compensation is the manager's reservation wage w plus, if total costs x_i are less than a predetermined amount s, the manager receives a bonus $g>0$.[2] Stated mathematically,

$$b(x_i)=\begin{cases} w+g, & \text{for } x_i<s; \\ w, & \text{otherwise,} \end{cases} \tag{4}$$

where w, g and s are the same for $i=1, 2$. Notice that, in each period, the manager receives either of two levels of utility—either $u(w+g)$ or $u(w)$. The following proposition indicates how this arrangement affects decision rule (3).

Proposition 1

Given decision rule (3) and the compensation arrangement (4), the manager strictly prefers the expenditure (chooses a_1) if and only if

$$P_1(s-e_1, s)<\alpha P_2(s, s+e_2), \tag{5}$$

where $P_i(a, b)\equiv \int_a^b p_i(x)dx$.

The proof is in Appendix 1.

Proposition 1 indicates that, for a lump-sum budget-based compensation arrangement, the manager spends e_1 that saves e_2 when the probability $P_1(s-e_1, s)$ that spending e_1 reduces period 1 compensation by g is less than the discounted probability $P_2(s, s+e_2)$ that saving e_2 increases period 2 compensation by g. To understand the intuition that underlies this result, consider how the expenditure decision can affect compensation, and thus the manager's expected utility, in each period.

For period 1 (the expression to the left of the inequality in (3)), consider compensation for three mutually exclusive and exhaustive outcomes—either (1) operating costs c_1 exceed the budget s, (2) operating costs plus the expenditure e_1 are less than the budget, or (3) operating costs are less than the budget but operating costs plus the expenditure exceed the budget. If operating costs exceed the budget $(c_1>s)$, then operating costs plus the expenditure also exceed the budget $(c_1+e_1>s)$, and, whether or not the expenditure is made, the manager does not receive the bonus $(b[c_i]=b[c_i+e_1]=w)$. If operating costs plus the expenditure are less than the budget $(c_1+e_1<s$, which implies $c_1<s-e_1)$, then operating costs alone also are less than the budget $(c_1<s)$ and the manager receives the bonus whether or not the expenditure is made $(b[c_1]=b[c_1+e_1]=w+g)$. Hence, if $c_1<s$ or if $c_1>s-e_1$, then spending e_1 does not affect period 1 utility—that is, the expression to the left of the inequality in (3)

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for discretionary costs [Anthony and Dearden, 1980, pp. 176–8].

[2] It should be noted that the microeconomic contracting literature offers no justification for analyzing budget-based compensation arrangements—that is, budgets have no role in existing studies of optimal arrangements [Demski and Kreps, 1982, p. 131]. We observe budget-based compensation in practice, however, and therefore, analyzing such arrangements has descriptive, if not normative, value.

equals zero. If, however, operating costs are less than the budget and also operating costs plus the expenditure exceed the budget (if $c_1 < s < c_1 + e_1$, which implies $s - e_1 < c_1 < s$), then by spending e_1 the manager forgoes the bonus in period 1. Thus, spending e_1 reduces period 1 utility from $u(w+g)$ to $u(w)$ if and only if the outcome is $s - e_1 < c_1 < s$, and therefore when making the expenditure decision, the manager assesses the probability $P_1(s - e_1, s)$ that this outcome occurs.

By similar reasoning, period 2 utility is affected if and only if operating costs exceed the budget but operating costs less the cost savings are less than the budget ($c_2 > s > c_2 - e_2$, which implies $s < c_2 < s + e_2$). Only then does saving e_2 mean that the manager receives incremental compensation g in period 2 ($b[c_2] = w$ and $b[c_2 - e_2] = w + g$), and the manager assesses the probability $P_2(s, s + e_2)$ that this outcome occurs.

Thus, when making the expenditure decision, the manager assesses and compares the probabilities that spending e_1 (which saves e_2) affects compensation, and thus utility, in each period. If the probability $P_1(s - e_1, s)$ that spending c_1 reduces period 1 compensation by g is less than the discounted probability $\alpha P_2(s, s + e_2)$ that saving e_2 increases period 2 compensation by g, then the manager makes the expenditure (chooses a_1); otherwise, he or she does not (chooses a_2).

Note that the decision rule (5) applies for all rational decision makers. This means that, in contrast to the general rule (3), knowing the utility function that describes the manager's intraperiod preferences for compensation is not critical. Hence, a practical advantage of using budget-based compensation is that doing so simplifies the task of identifying a general compensation arrangement for all managers. The manager's interperiod preferences for compensation (α) remain relevant, however. That is, for specified probabilities $P_i(.,.)$, increasing relative utility for current versus future compensation (decreasing α) diminishes incentives to spend. Note also that, to determine how s affects expenditure decisions, those who set standards must know the manager's probability assessments $p_i(x)$ of current and future operating costs.

4. Comparing the Effects of Tight Versus Loose Budgets

Decision rule (5) indicates that the level of the budget, s, affects expenditure decisions by influencing the probabilities $P_i(.,.)$. To explore further how setting budgets affects these decisions, we make assumptions about these probabilities. Specifically, for both periods, assume single-peaked distributions $p_i(c)$ of costs with mode $\hat{c}_i$, and let

$$s \equiv \begin{cases} s_T & \text{for} \quad s \leq \hat{c}_i \\ s_L & \text{for} \quad s > \hat{c}_i, \end{cases} \tag{6}$$

where $p_i(s_T) = p_i(s_L) > 0$ exists for all (s_T, s_L). If the cost budget is set below the mode ($s = s_T$), then we say that the budget is *tight*, but if the budget is set above the mode ($s = s_L$), then we say that the budget is *loose*.

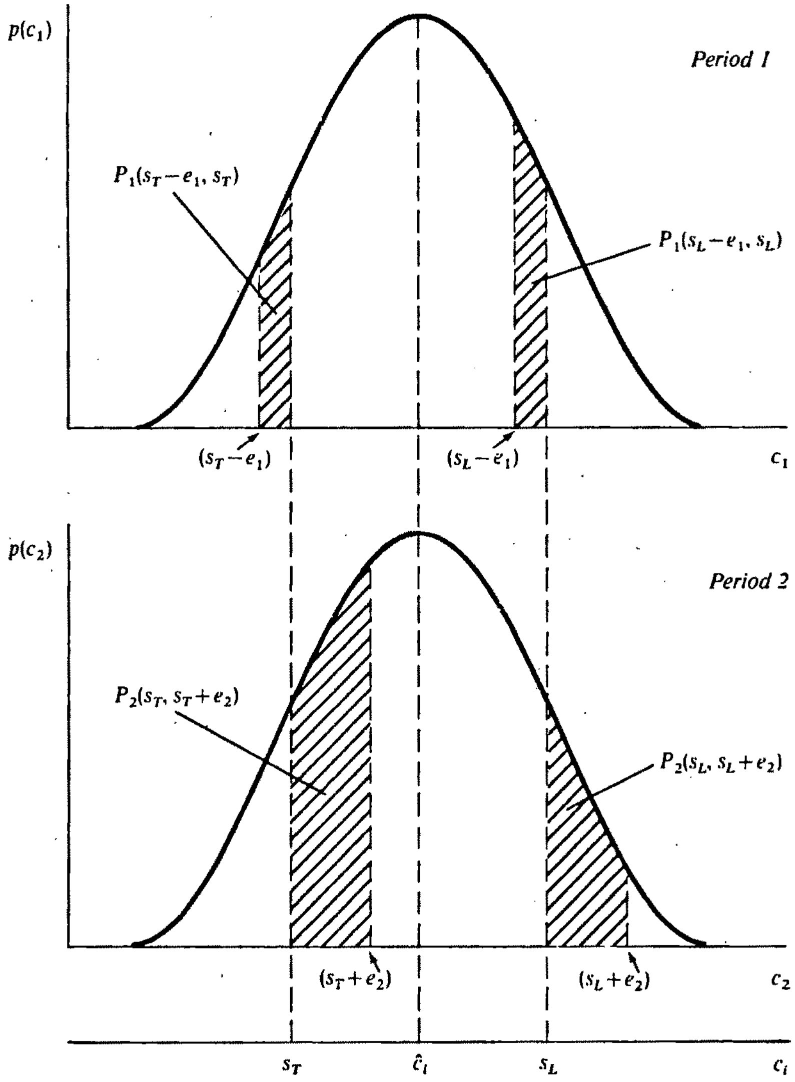
Finally, let $G(s)$ be the set of pairs (e_1, e_2) for which investment is preferred to no investment for specified s. In other words, the set $G(s)$ includes all expenditures e_1 that save e_2 and satisfy (5) when the budget for operating costs is s. Given this characterization, the following result applies.

Proposition 2

If (1) $p_1(c)$ and $p_2(c)$ are symmetric with equivalent $\hat{c}_i$, and/or (2) $p_1(c)$ and $p_2(c)$ are identical, then for specified s_L there exists an s_T such that $G(s_L) \in G(s_T)$. The proof is in Appendix 2.

FIGURE 1

PROBABILITIES $P_i(.,.)$ THAT THE EXPENDITURE (e_1, e_2) AFFECTS COMPENSATION



The proposition states that, given single-peaked cost distributions $p_i(c)$, if the distributions for both periods are either (1) symmetric with equal expectation, (2) identical, or (3) both, then every expenditure pair (e_1, e_2) preferred under a specified loose budget s_L is also preferred under some tight budget s_T.

Figure 1, which displays distributions that satisfy the symmetry requirement, illustrates the logic that underlies this result. Consider any loose budget s_L and the corresponding tight budget s_T such that $p(s_L) = p(s_T)$. Note that, for any e_1, the probability $P_1(s - e_1, s)$ that spending specified e_1 costs the manager g in period 1 is greater for the loose budget than for the tight budget. Note also that, for any

e_2, the probability $P_2(s, s+e_2)$ that saving the related e_2 yields incremental compensation g in period 2 is greater for the tight budget than for the loose budget. This means that all expenditures preferred for the loose budget are preferred for the tight budget, and further, there may exist expenditures preferred for the tight budget but not preferred for the loose budget. Thus, if encouraging expenditures is the objective, then a tight budget and not a loose budget should be imposed.

5. CONCLUSIONS

Implementing a lump-sum budget-based compensation arrangement means that, when evaluating discretionary expenditures that yield future cost-savings, managers assess and compare the probabilities that making the expenditures affects their current and future compensations. Specifically, for a proposed expenditure, if the discounted probability that the related savings increase future compensation exceeds the probability that the expenditure decreases current compensation, then the manager makes the expenditure. The level of the budget influences these decisions because it affects these probabilities. For specified costs distributions, tight, rather than loose, budgets result in lower probabilities that a given expenditure decreases current compensation and greater probabilities that the related savings from making the expenditure increase future compensation. Hence, the manager is more likely to invest in projects that yield future savings when budgets are tight.

Five assumptions are required to obtain this result. Specifically, the analysis requires that (1) managers receive a reservation wage plus, if total controllable costs are less than the budgeted amount, managers receive a lump-sum bonus; (2) manager utility is separable and independent in current and future utility; (3) current and future operating cost distributions are known to be single-peaked, independent, and either identical or symmetric with equal expectations; (4) the proposed expenditure and the related savings are known with certainty; and (5) the budgeted and bonus amounts are known and are the same for the current and future periods. In practice, individuals who set budgets need to determine whether these assumptions approximate the relevant decision context. Even so, the analysis demonstrates how (1) budgets can be used to control discretionary investment and (2) imposing tight budgets to motivate managers can foster greater, and not lesser, investment that yields future benefit.

APPENDIX 1

PROOF OF PROPOSITION 1

Proposition

Given decision rule (3) and the compensation arrangement (4), the manager prefers the expenditure (chooses a_1) if and only if

$$P_1(s-e_1, s) < \alpha P_2(s, s+e_2),$$

where $P_i(a, b) \equiv \int_a^b p_i(x)dx$.

Proof of the Proposition

Separating (3) into definite integrals and substituting for $b(\cdot)$ using (4) gives

$$\int_{-\infty}^{s-e_1}\{u(w+g)-u(w+g)\}p(c_1)dc_1+\int_{s-e_1}^{s}\{u(w+g)-u(w)\}p(c_1)dc_1$$
$$+\int_{s}^{\infty}\{u(w)-u(w)\}p(c_1)dc_1<$$
$$\alpha\left[\int_{-\infty}^{s}\{u(w+g)-u(w+g)\}p(c_2)dc_2+\int_{s}^{s+e_2}\{u(w+g)-u(w)\}p(c_2)dc_2\right.$$
$$\left.+\int_{s+e_2}^{\infty}\{u(w)-u(w)\}p(c_2)dc_2\right].$$

The first and third terms in each side of the inequality are zero so that the manager strictly prefers a_1 if and only if

$$\int_{s-e_1}^{s}\{u(w+g)-u(w)\}p(c_1)dc_1<\alpha\int_{s}^{s+e_2}\{u(w+g)-u(w)\}p(c_2)dc_2,$$

or since $u(\cdot)$ is identical for both periods, if and only if

$$P_1(s-e_1,s)<\alpha P_2(s,s+e_2).$$

APPENDIX 2

PROOF OF PROPOSITION 2

Assume that $p_1(c)$ and $p_2(c)$ are single-peaked with mode $\hat{c}$, and define

$$s\equiv\begin{cases}s_T & \text{for} \quad s\le\hat{c}\\ s_L & \text{for} \quad s>\hat{c}.\end{cases}$$

First we prove the following lemma.

Lemma

For any $e>0$ and specified $s_L>s_T$ such that $p(s_L)=p(s_T)$,

$$P(s_T-e,s_T)\le P(s_L-e,s_L), \tag{7}$$

and

$$P(s_T,s_T+e)\ge P(s_L,s_L+e). \tag{8}$$

Proof of the Lemma

The proof exploits the property of single-peaked distributions that for $\delta\ge0$,

$$p(c)\ge p(c-\delta) \qquad \text{for } c\le\hat{c}, \tag{9}$$

and

$$p(c)\ge p(c+\delta) \qquad \text{for } c\ge\hat{c}. \tag{10}$$

Note that for any $e>0$ and all $0\le\delta\le e$, if

$$p(s_T-\delta)\le p(s_L-\delta) \tag{11}$$

then (7) holds and if

$$p(s_T+\delta)\geq p(s_L+\delta), \tag{12}$$

then (8) holds.

For all $0\leq\delta\leq(s_L-\hat{c})$, (9) implies $p(s_T)\geq p(s_T-\delta)$ and (10) implies $p(s_L-\delta)\geq p(s_L)$ which implies (11) since $p(s_L)=p(s_T)$. For all $\delta>(s_L-\hat{c})$, (9) implies (11) since $s_L>s_T$. Thus, (11) holds for all $0\leq\delta\leq e$ which implies (7).

For all $0\leq\delta\leq(\hat{c}-s_T)$, (9) implies $p(s_T+\delta)\geq p(s_T)$ and (10) implies $p(s_L)\geq p(s_L+\delta)$ which implies (12) since $p(s_T)=p(s_L)$. For all $\delta>(\hat{c}-s_T)$, (10) implies (12) since $s_L>s_T$. Thus, (12) holds for all $0\leq\delta\leq e$ which implies (8).

Next we use the foregoing result to prove the proposition.

Proposition

If (1) $p_1(c)$ and $p_2(c)$ are symmetric with equivalent $\hat{c}_i$, and/or (2) $p_1(c)$ and $p_2(c)$ are identical, then for specified s_L there exists an s_T such that $G(s_L)\in G(s_T)$.

Proof of the Proposition

Conditions (1) and (2) guarantee that, for all (s_T, s_L), if $p_i(s_T)=p_i(s_L)>0$, then $p_j(s_T)=p_j(s_L)>0$ for $i,j=1,2$ and $i\neq j$. Using (5), if specified $(e_1, e_2)\subset G(s_L)$, then by definition

$$P_1(s_L-e_1,\ \ s_L)<\alpha P_2(s_L,\ \ s_L+e_2). \tag{13}$$

Expressions (7) and (8) imply that

$$P_1(s_T-e_1, s_T)\leq P_1(s_L-e_1, s_L), \tag{14}$$

and

$$P_2(s_T, s_T+e_2)\geq P_2(s_L, s_L+e_2). \tag{15}$$

Multiplying (15) by $\alpha>0$ and comparing the result with (13) and (14) gives

$$P_1(s_T-e_1, s_T)<\alpha P_2(s_T, s_T+e_2), \tag{16}$$

which implies that $(e_1\ e_2)\subset G(s_T)\in G(s_T)$.

Note that $(e_1, e_2)\subset G(s_T)$ does not imply $G(s_T)\in G(s_L)$.

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Taxes and Risk Sharing

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ABSTRACT: Models that characterize Pareto-efficient sharing of joint venture profits or constrained Pareto-efficient sharing of income in principal-agent contracting problems have ignored tax considerations. We extend the theory by showing that the effect of taxes on optimal contracting (both in the face of and in the absence of moral hazard problems) is related to the effect of changes in risk attitudes towards lotteries over pre-tax income. For example, optimal contracts will reflect the tax-induced demand for insurance of a risk-neutral individual who faces a progressive income tax schedule; that is, the risk-neutral individual will not bear all the risk, and in the face of moral hazard on the act selection of a risk-neutral agent, demand for monitoring will be created where none existed in the absence of the progressive tax. We also show that Pareto-optimal risk-sharing contracts do not generally result in expected tax minimization, even when taxes are modeled as a deadweight loss to the system.

THIS paper is concerned with the nature of efficient risk sharing and incentive arrangements in a partnership (joint ownership of an income-producing project) when part of each owner's income from the partnership is unavailable for private consumption purposes. The difference between an owner's *gross* income from the partnership and *net* income (over which preferences are assumed to be directly defined) results from taxes that are a function of gross income. We analyze risk sharing and incentive arrangements between two partners. We assume that both partners are VonNeumann-Morgenstern (VN-M) expected utility maximizers.

The outcome (e.g., cash) available to the partnership, $x(s,a)$, is treated as a joint function of an action choice, a, taken by one of the partners (typically termed the agent) and a random state occurrence, s. The action is assumed to be a source of welfare reduction to the agent, i.e., the agent is effort-averse. We will consider two distinct but related settings. If the action choice is unobservable to the passive partner (the principal), a moral hazard setting is said to exist. In such a setting the optimal contract must be structured so as to induce the agent to work "hard," since without appropriate incentives shirking will result without fear of detection. In a full information setting, the agent's action choice is observable (or inferrable) by the principal and, hence, can be used as a contracting variable. Then the optimal action can be contracted on directly. For example, the agent may be severely penalized unless the contractu-

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ally specified act is supplied. Hence, without loss of generality we can suppress effort level in the formulation of the contracting problem in the full information setting. Initially, we consider a full information formulation in which the problem is to characterize the set of Pareto-optimal risk-sharing contracts.[1] The basic formulation of an optimal risk sharing contract without moral hazard is due to Wilson [1968]. We extend this result to a setting that includes taxation. We will address the moral hazard incentive problem in a taxation environment in a later section of the paper.

TAXES AND PARETO-OPTIMAL RISK SHARING: THE FULL INFORMATION CASE

The problem confronting the partnership is to construct a sharing rule that distributes the outcome X to the partners for all possible realizations, x.

Each partner is subject to taxes on partnership income. Let $z_i(x)$ be partner i's share of the partnership income, when x is realized. Let $T_i(z_i)$ denote after-tax income; that is, T_i is a function (assumed to be continuously differentiable) that maps pre-tax income z_i into after-tax income $T_i(z_i)$. Note that the tax is equal to $z_i - T_i(z_i)$.[2] Finally, $U_i(T_i(z_i))$ denotes the $(VN-M)$ utility function, which is defined over after-tax income.

Pareto-optimal risk-sharing contracts in a full information setting are given by the following variational problem:

$$\underset{z_2(x)}{\text{Max}} \int U_1(T_1(x-z_2(x)))f(x)dx + \lambda \int U_2(T_2(z_2(x)))f(x)dx, \quad (1)$$

where λ is a non-negative multiplier on partner 2's expected utility. Since all Pareto-optimal contracts are characterized by $z_1(x)+z_2(x)=x$ for all x, we have expressed the problem in terms of choice of the sharing function to partner 2. $z_1(x)$ is then simply equal to $x-z_2(x)$. As noted above, we may suppress the action choice and treat the partnership as endowed with a random variable X with density function $f(x)$.

The first order condition for (1) is given by:

$$U_1'(T_1(x-z_2(x)))T_1'(x-z_2(x)) = \lambda U_2'(T_2(z_2(x)))T_2'(z_2(x)) \forall x, \quad (2)$$

where primes (′) denote derivatives. We now get the slope of the optimal risk sharing contract by differentiating (2) with respect to x and substituting $U_1'T_1'/U_2'T_2'$ for λ. The slope indicates how a marginal change in the total partnership payoff is allocated to the partners:

$$z_2' = \frac{\rho_1 T_1' - \tau_1}{\sum_{i=1}^{2} \rho_i T_i' - \tau_i}, \quad (3)$$

where $\rho_i (\equiv -U_i''/U_i')$ is evaluated at after-tax income and $\tau_i (\equiv T_i''/T_i')$ is evaluated at pre-tax income. Note that ρ_i is the global measure of risk aversion (called absolute risk aversion) developed by Pratt [1964], which he shows to be "twice the risk premium per unit of variance for infinitesimal risks" [p. 125].

τ_i can be viewed as a measure of progressivity in the income tax. A progressive income tax is defined as one that is convex in pre-tax income. We assume that marginal tax rates are always below 100 percent. Hence, a progressive tax corresponds to $\tau_i < 0$, and a regressive tax is equivalent to $\tau_i > 0$.[3] Note that $\tau_i = 0$

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[1] A risk-sharing contract is Pareto-optimal if there does not exist another contract that leaves both of the partners at least as well off and one of the partners strictly better off in the sense of a higher expected utility.

[2] Taxes are assumed to be deadweight losses to the partners. This is discussed more fully below.

[3] Recall that $T(z)$ is after-tax income, and the tax is $z - T(z)$. Denote this tax $t(z)$. A progressive tax is one

when the tax is proportional, a lump-sum, or a combination of lump-sum plus proportional.

In the absence of taxes, (3) simplifies to the familiar result of Wilson [1968]:

$$z_2' = \frac{\rho_1}{\rho_1 + \rho_2} \cdot \tag{4}$$

Each partner's *variable* share of partnership income is equal to one minus the ratio of his risk aversion to the aggregate risk aversion of both partners.[4]

Note from (4) that if partner 2 is risk-neutral ($U_2'' = 0$), then $\rho_2 = 0$ and $z_2' = 1$. In this case, all Pareto-optimal risk-sharing contracts (in the absence of taxes) involve partner 2 bearing all the risk and partner 1 receiving a fixed payment independent of partnership income. In the face of taxes, however, this risk-sharing arrangement is not generally optimal. For example, a progressive tax induces risk aversion. Even though partner 2 is risk-neutral towards after-tax lotteries, he is strictly risk-averse towards pre-tax lotteries. The reason is that a mean-preserving spread in pre-tax income increases the expected tax and hence reduces expected after-tax income, since the progressive tax is convex in pre-tax income. If the tax were a regressive one, risk-*seeking* behavior would be induced.[5]

When both partners are strictly risk-averse, even a lump sum tax will typically affect the set of Pareto-optimal risk-sharing contracts. Even though (3) and (4) look similar in this case, the ρ_i are evaluated at different levels of income.

The problem can be viewed as equivalent to a taxless setting in which each partner earns non-partnership-related income in addition to his partnership share. When one of the partners experiences a change in non-partnership wealth level, his absolute risk aversion $(-U_i'')/(U_i')$ will typically change. As can be seen by examination of (3), this will cause an adjustment to the optimal contract. The only exceptions to this are constant absolute risk aversion utility functions. For these functions—linear, negative exponential, and affine transformations thereof—absolute risk aversion is invariant with respect to wealth level. See Pratt [1964]. In these cases, the partnership contracting choice can be decomposed from non-partnership wealth levels, whether from outside income or the imposition of a lump sum tax.

TAX MINIMIZATION AND PARETO-OPTIMAL RISK SHARING

Pareto-optimal risk sharing does not, in general, minimize expected taxes. However, the set of Pareto-optimal risk-sharing contracts coincides with the set of expected tax-minimizing contracts for the special case in which both partners are risk-neutral, as we prove below. Note that tax minimization is equivalent to maximization of after-tax income when all partnership income is distributed. Hence, the set of expected tax-minimizing contracts is given by:

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that satisfies $d^2t(z)/dz^2 > 0 \forall z$, or, equivalently, $d^2T(z)/dz^2 < 0 \forall z$. We assume that the marginal tax rate is always less than 100 percent. Hence, $dT(z)/dz > 0 \forall z$, and a progressive tax corresponds to $\tau < 0$. Similarly, a regressive tax corresponds to $\tau > 0$.

[4] Equivalently, $z_2' = \rho_2^{-1}/(\rho_1^{-1} + \rho_2^{-1})$, where ρ_i^{-1} is defined by Wilson [1968] as the *risk tolerance*: "half the tolerable variance per unit of compensating risk premium for infinitesimal risks" [p. 121]. Each partner's variable share of partnership income is equal to the ratio of his risk tolerance to the aggregate risk tolerance of both partners.

[5] If the tax is regressive, the first-order condition for the maximization problem in (1) may not be sufficient. For example, if both partners are risk-neutral and the tax is strictly concave in pre-tax income, Pareto-optimal sharing rules do not exist without further restrictions on the set of available contracts. Henceforth, we restrict attention to nonregressive taxes.

$$\underset{z_2(x)}{\text{Max}} \int T_1(x - z_2(x)) f(x)dx + \mu \int T_2(z_2(x)) f(x)dx, \quad (5)$$

where μ is a positive constant corresponding to a particular expected after-tax income for partner 2. Following the approach used to derive equation (3) from equation (1), the risk-sharing contract that minimizes expected taxes results in the following sharing of risks:

$$z_2' = \tau_1/(\tau_1 + \tau_2). \quad (6)$$

Note that (3) simplifies to (6) for the special case in which both partners are risk-neutral, since $\rho_1 = \rho_2 = 0$ in this case. This completes the proof.

The set of Pareto-optimal risk-sharing contracts also coincides with the set of tax-minimizing contracts when one of the partners is strictly risk-averse and is subject to a strictly progressive income tax, while the other partner is risk-neutral and is subject to a lump sum, proportional, or combination of lump sum plus proportional tax. It is routine to verify that (3) and (5) coincide in this case; the risk-neutral partner optimally bears all the risk. This situation might approximate the case of an individual contracting with a wealthy corporate partner.

In the more general case, Pareto-optimal risk sharing departs from tax minimization. To see this, suppose that one partner is subject to a strictly progressive tax ($\tau_1 < 0$), and the other partner is subject to a lump sum plus proportional tax ($\tau_2 = 0$). The tax minimizing contract specified by (6) requires that partner 2 bear all the risk. However, if partner 2 is *risk-averse*, the Pareto-optimal risk-sharing contract given by equation (3) requires that both partners bear some risk.

A simple numerical example follows. Let partner 1 be *risk-neutral* and subject to a progressive tax so that after-tax wealth is of this form: $T_1(z) = z^{.96}$. Similarly, let partner 2 be *risk-averse* but with a proportional tax, $T_1(z) = .8z$. Let partner 2's $VN-M$ utility function in after-tax wealth be $U(w) = 1000 \cdot (1 - e^{-w/1000})$. Since partner 1's after-tax wealth is a concave function of the partnership share, a contract which mazimizes expected after-tax wealth to the partnership requires that partner 1 receive a fixed fee. For concreteness, let the pre-tax cash inflow to the partnership be one of two equiprobable amounts: $1000 or $100. An expected tax-minimizing contract is:

	Pre-tax Share		*Tax*	
Outcome	*Partner 1*	*Partner 2*	*Partner 1*	*Partner 2*
1000	100	900.00	16.82	180.00
100	100	0.00	16.82	0.00

The expected aggregate tax to the partnership is $106.82. The expected utility to the two partners is:

Partner 1: 83.18
Partner 2: 256.62

Notice that all the risk is borne by partner 2 who is risk-averse; opportunities for Pareto improvement are clear. Consider the following contract:

	Pre-tax Share		*Tax*	
Outcome	*Partner 1*	*Partner 2*	*Partner 1*	*Partner 2*
1000	205.86	794.14	39.51	158.83
100	0.00	100.00	0.00	20.00

The expected aggregate tax to the partnership is \$109.17 versus \$106.82 in the previous contract. The expected utility to each partner is:

Partner 1: 83.18
Partner 2: 273.56

Although the expected tax has increased, a welfare improvement is obtained by improving the risk-sharing characteristics of the contract.[6]

TAXES AND INCENTIVE CONTRACTING UNDER CONDITIONS OF MORAL HAZARD

Thus far, we have restricted attention to the effect of taxes on risk sharing in a full information setting. These effects were shown to be related to induced changes in risk attitudes towards lotteries over pretax income. In this section we maintain the basic partnership structure but abandon the full information assumption. Instead we assume that the productive act is both unobservable to the passive partner (principal) and costly to the active partner (agent). In this way we formulate a standard agency problem and examine the effects of taxes on incentives.

In the familiar principal-agent problem,[7,8] a demand for a monitoring technology may arise when the agent's act is unobservable to the principal and, hence, cannot be used directly as a contracting variable. This demand is a manifestation of the social loss that results from excessive risk (relative to the Pareto-optimal amount) being forced upon a risk-averse agent in order to motivate the desired level of effort.

In the standard agency setting, the effort level of the agent affects the solution in two ways. Effort is an argument of the agent's preference function which is typically represented as additive in income and effort:

$U(z, a) = U_2(z) - V(a)$, where a is effort level.

Furthermore, the effort level of the agent is modeled as a parameter of the stochastic production function that is represented by the conditional density function $f(x|a)$. The typical assumption is that increasing the effort level shifts the outcome density function to the right in the sense of first-order stochastic dominance.

If the effort is unobservable and, hence, unavailable for contracting purposes, the agent will choose an effort level so as to satisfy

$$\operatorname*{Max}_{a} \int U_2(T_2(z_2(x)))f(x|a)dx - V(a).$$

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[6] Actually, further improvements are theoretically possible by shifting more of the risk to partner 1, but this would require assigning a negative income to partner 1 half the time, over which, in this example, the tax function is not defined.

[7] For a recent survey of this literature, see Baiman [1982].

[8] The basic features of the problem are: (1) the principal and agent jointly share the realization from a stochastic outcome (production) distribution; (2) there are (at least) two factors of production: nature (the random factor) and effort (the choice of which is delegated to the agent); (3) the agent derives disutility from expending effort; and (4) effort is not directly observable by the principal.

The first-order condition is

$$\int U_2(T_2(z_2(x)))f_a(x|a)dx = V'(a). \quad (7)$$

The socially preferred (Pareto-optimal) effort level solves the following problem:

$$\underset{a}{\text{Max}} \int U_1(T_1(x - z_2(x)))f(x|a)dx + \mu \int U_2(T_2(z_2(x)))f(x|a)dx - \mu V(a).$$

The first-order condition is

$$\int U_1(T_1(x - z_2(x)))f_a(x|a)dx + \mu \int U_2(T_2(z_2(x)))f_a(x|a)dx = \mu V'(a). \quad (8)$$

For both (7) and (8) to hold requires

$$\int U_1(T_1(x - z_2(x)))f_a(x|a) = 0. \quad (9)$$

To satisfy (9), in general, $x - z_2(x)$ must be independent of x or $z_2(x) = x - c$, where c is any constant. This means that the agent internalizes fully the social effect of his act selection. That is, he or she derives all the benefits from the act in terms of increased productivity, as well as bearing the entire cost, $V(a)$. However, the agent also assumes all the risk of the uncertain outcome, and optimal risk sharing as embodied in (3) may be sacrificed. We say that there is an "agency problem" if there does not exist a contracting arrangement that simultaneously satisfies (8) and (3). Risk sharing and act selection considerations must be traded off against each other. When an "agency problem" exists, there arises a demand for a monitoring technology that renders the agent's act observable, thereby making it accessible for contracting purposes.

The demand for a monitoring technology is affected by the imposition of a a tax in a way similar to the effect of a change in the agent's risk aversion. For example, a progressive tax could create a demand for monitoring where none existed in the absence of the tax. To see this, suppose that the agent is risk-neutral. In this case it is optimal (in a Pareto-efficient sense) for the agent to bear all the risk with the principal receiving a "fixed fee."[9] Since the agent is risk-neutral there is no efficiency loss from a risk-sharing standpoint. Furthermore, with the agent bearing all the risk, the externality problem is now solved in the sense that the agent will now select that effort level which equates the expected utility of exactly 100 percent of his marginal productivity with the marginal cost of achieving the additional output in terms of effort disutility.

The contract that satisfies (9) is $z_2(x) = x - c$. This amounts to selling the firm to the agent for an amount c. From equation (3) it follows that this contract also satisfies optimal risk sharing if the agent is risk-neutral ($\rho_2 = 0$) and the tax is linear ($\tau_2 = 0$). For $\rho_2 = \tau_2 = 0$, equation (3) implies that $z_2' = 1$.

If a progressive tax is imposed on the agent, we have $\tau_2 > 0$. Then both (9) and (3) cannot hold simultaneously and an agency problem is created. To motivate the agent to exert the proper level of effort, the agent must bear more risk than the Pareto-optimal amount. Sub-optimal risk sharing in this case results entirely from the agent's income tax-induced risk aversion.

A simple numerical example illustrates the point. Let the partnership be endowed with the stochastic productive opportunities embodied in the following act-state matrix with equiprobable states, where all entries are dollar outcomes (cash) to the partnership.

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[9] See Harris and Raviv [1979] or Grossman and Hart [1983].

Act	State θ_1	State θ_2
a_1	1000	100
a_2	100	100

Act a_1 is more costly to the agent than a_2:

$$V(a_1)=100$$
$$V(a_2)=0$$

Initially, suppose that both partners (principal and agent) are subject to a 20 percent proportional tax. In a full information setting (when the agent's act is observable to the principal), one efficient contract is to pay the agent \$250 to supply a_1 and give the principal the residual. The expected utility payoffs to the risk-neutral partners are

Agent: 100
$(=250\times 80\% - V(a_1))$
Principal: 240
(=80% of the expected residual).

The same result can be achieved in a setting of moral hazard where the act (and state) is unobservable to the principal, but the outcome is observable; for example, pay the agent \$375 if the outcome is \$1000 and \$125 if the outcome is \$100. Although the principal cannot detect shirking directly, the agent is still willing to choose the personally more costly act, a_1, because of a commensurate increase in expected payoff.[10] Although the agent assumes more risk under this contract, there is no efficiency loss to the partnership because the agent is risk-neutral.

Now consider an identical setting as above, except that the agent is subject to a progressive tax (recall that $T(z)$ is after-tax income):

$$T(z)=z^{.9}$$

An efficient contract in a full information setting is for the principal to pay the agent \$250 to choose a_1. The expected payoffs to the partners are

Agent: 43.93
Principal: 240.00

This result cannot be replicated in a moral hazard setting. It remains optimal in this example to induce the agent to choose a_1. The minimum amount of risk required to do this, keeping the agent's expected utility equal to what it was in the full information case, is given by the following contract:[11]

Partnership Outcome	*Payment to Agent*
\$1000	\$449.28
100	66.88

The expected utility payoffs are

Agent: 43.93
Principal: 233.54

The efficiency loss to the partnership is represented by the decline in expected payoff to the principal of \$240.00 − \$233.54 = \$6.46. This is due to inefficient risk sharing caused by the agent's *tax-induced* risk aversion. In the moral hazard setting there is a demand for a monitoring technology (such as auditing) in order to render the act selection observable and, hence, available for contracting. In this example, the principal is willing to pay \$6.46/0.8 = \$8.08 for perfect monitoring, assuming that the cost of the technology is tax-deductible at the principal's tax rate of 20 percent.

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[10] We make the usual assumption that if the agent is indifferent between two action choices, the one preferred by the principal will be chosen.

[11] Note that if in the full information setting it is optimal for the agent to supply the lower effort level (a_2), then the introduction of the progressive tax would *not* introduce an incentive problem (i.e., no risk would have to be imposed on the agent to induce the supply of the desired effort.

CONCLUSIONS AND LIMITATIONS

This paper may be viewed as an analysis of optimal contracting behavior in the face of taxes. Our focus has been on contracts written for the efficient sharing of tax-induced risk aversion. We have demonstrated that changes in the tax law may induce changes in economic behavior, including changes in the demand for a monitoring technology. Some of the tax-induced contracting effects may be non-intuitive. For example, not all recontracting behavior in response to tax changes is for the purpose of tax reduction. Some contracting changes may actually increase the expected aggregate partnership tax liability as more efficient (tax-induced) risk-sharing arrangements are sought.

Throughout the paper, we have viewed the difference between the partner's *gross* income from the partnership and *net* income (over which preferences are assumed to be directly defined) as resulting from taxes that are a function of gross income. However, other interpretations are possible. For example, one could view this paper as an analysis of efficient risk-sharing contracting in the face of contract enforcement costs or in the face of franchising fees that are a function of the partners' gross shares from the partnership.

Finally, taxes have been modeled in this study as if they are deadweight costs to the partners. While this may be true of contract enforcement costs or franchise fees, there is certainly another side to taxes, *viz*., receipt of government benefits (B). If we were to assume that preferences over income and government benefits admit to an additive and separable utility representation, *i.e.*, $U(z, B)=F(z)+G(B)$, and if we assume that the distribution function of B is independent of the sharing rules adopted, then all of the earlier analysis holds more generally. But these are highly unrealistic assumptions. Indeed, one might think of B as representing income redistributions, in which case $U(z, B)=F[T(z)+B(Y)]$, where Y represents aggregate income. Even if we were to assume that B_i is independent of z_i, risk tolerance will still generally depend upon B_i, unless there is constant risk aversion.

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Some Empirical Evidence on Taxpayer Rationality

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ABSTRACT: Little is known about the speed and accuracy of aggregate taxpayer response to an income tax law change. Using a multiple time series model, it was found that individuals and corporations quickly and relatively accurately adjust their income tax prepayments in response to a tax increase.

THERE has been considerable research which shows that changes in the tax law affect economic behavior. An underlying assumption of those involved in decisions involving tax policy is that taxpayers are rational and will adapt their collective behavior to changes in the tax law, yet little empirical evidence exists which demonstrates the speed and accuracy of taxpayer response to such changes. The speed and accuracy of taxpayer response to tax law changes has at least one important policy implication. Although revenue change estimates typically accompany changes in the tax law, such estimates are stated in terms of effects for a fiscal period and do not take into account the timing of cash flows which may affect budgeting and borrowing costs of the governmental unit. The purpose of this paper is to determine the extent of individual and corporate taxpayer rationality in terms of speed and accuracy of their collective response to one change in the tax law, the passage of Proposition 13 by the voters of California.

I. BACKGROUND

How should taxpayers react to a tax law change? If taxpayers are rational, then they should react accurately to any tax change applicable to them. Rational taxpayers should also react quickly to such changes by adjusting their prepayments of their annual taxes, since failure to make such an adjustment could result in overpayment of taxes (if the change is a tax decrease) or penalties (if the change is a tax increase) based on the duration and amount of the underpayment.

Both individuals and corporations are subject to prepayments of their estimated annual income taxes. For most individuals, this prepayment is accomplished through withholding on wages. In cases where withholding is insufficient, individuals must also pay estimated taxes. Corporations prepay income taxes solely through estimated taxes. Estimated taxes are remitted directly by individuals and corporations on a quarterly basis.

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Withholding and estimated taxes can be adjusted throughout the year as the ultimate tax burden is more accurately determined. In that sense, prepayments can reflect current impacts on the taxpayer's taxable income, as well as the taxpayer's expectations about taxable income for the remainder of the year.[1]

Since Proposition 13 caused an income tax increase (by decreasing deductions and increasing taxable incomes), rational taxpayers affected by Proposition 13 should have accurately increased their prepayments immediately after Proposition 13's passage. A normative model for this adjustment appears in Appendix 1.

The Intervention Event

On June 6, 1978, the voters of California approved Proposition 13, a property tax initiative. Proposition 13 reduced the rate of property taxation from approximately 2½ percent of the market value to a maximum of one percent, and placed restrictions on the growth rate of the assessed value of real property. The immediate effect was an approximate $7 billion reduction in property tax revenues and hence, deductions by taxpayers.

Proposition 13 was chosen as the study's intervention for several reasons. First, because real estate taxes paid or accrued are income-tax deductible by both individuals and firms, Proposition 13's reduction in property taxes caused a reduction in real estate tax deductions, thereby increasing taxable income and income taxes. Second, Proposition 13 was a "clean" tax change in that its effects on income tax should be clear and unidirectional. This "cleanliness" attribute is not necessarily true in many tax law changes, which often have multiple provisions that have various effects on income tax. Third, Proposition 13 was well-publicized before its passage, and this publicity allowed for the possibility of taxpayers planning their income tax adjustments in advance. Fourth, the effects of Proposition 13 were large enough to affect tax liabilities significantly.

Several studies have demonstrated this large income tax effect. One such study by the Congressional Budget Office [1978] estimated increased federal income tax revenues of $628 million for 1979 and $911 million for 1980 from Proposition 13's passage. These estimates were based on direct effects of $1,028 and indirect effects of $400 million for 1979, and $1,311 and $400 million, respectively, for 1980. The direct effects were tax revenue increases from decreased property tax deductions on federal returns, while the indirect effects were tax revenue losses due to projected consumer price index and economic activity decreases as a result of Proposition 13's deflation effect and the losses it caused in public sector employment. The study also estimated the changes shown in Table 1:

Thus, it was estimated that up to 22 percent ($628 + 911 divided by $7044) of the revenue from the property tax relief flowed from California to the federal government through increased income taxes. The study also estimated that taxpayers in owner-occupied real estate would claim 50 percent of the immediate property tax deduction decrease in 1979 and the remainder in 1980. All other real estate owners (businesses) would deduct 75 percent in 1979.

[1] While individuals and corporations are generally required to have prepaid at least 80 percent of their ultimate annual tax, there are "exceptions" to this rule that, if met by the taxpayer, will not result in an underpayment-of-tax penalty. These "exceptions" are: if the estimated tax payments are based on the tax or income shown on the preceding year's return, or on interim income figures for the current year, providing specific conditions are satisfied.

TABLE 1

OTHER EFFECTS OF PROPOSITION 13 (IN $ MILLIONS)

	Federal Revenue Gain		*Property Tax Relief Fiscal Year 1978-79*	
	1979	*1980*		
Personally occupied residences	$230	$490	$2,341	33.2%
Rented residential	200	179	1,200	17.0%
Corporations & Industry	329	281	1,916	27.2%
Agriculture & State Government	269	361	1,587	22.6%
Less: Indirect revenue loss	(400)	(400)		
TOTALS	$628	$911	$7,044	100%

Chernick and Reschovsky [1982] estimated that Proposition 13 would result in $864 million in higher combined federal and California income tax revenues. Kimbell, Shih, and Shulman [1979, p. 321] found a 4.6 percent decline in California state and local employment, the "largest and most abrupt drop in the history of the series." This observation would add support to the indirect effects on federal revenues in the U.S. Congressional Budget Office Study [1978]. Finally, a study in Survey of Current Business [1978] estimated that federal and state income taxes would increase by $700 million and $200 million, respectively, for the third quarter of 1978 as a result of Proposition 13.

A final reason for choosing Proposition 13 as this study's intervention event is that no confounding tax law changes appeared to have occurred during the same time period. An economic downturn approximately one year after Proposition 13's passage could have been confounding, however. This downturn resulted from a protracted recession and rapidly rising interest rates.[2] The downturn seemed to have a different effect on individuals than on corporations. Individual real (deflated) personal income declined on a per-capita basis from 1979-1982 [California State Board of Equalization, 1980-82], yet total real California personal income [California State Board of Equalization, 1980-82] and taxable incomes (as well as tax) [California Franchise Tax Board, 1979-1981] continued to rise during this period, presumably due to increasing net migration into California.

Corporations, however, seemed to be more seriously affected by the economic downturn. Total corporate taxable income and tax [State of California Franchise Tax Board, 1981], corporate profit growth [Governor of California, 1979], and real (deflated) taxable sales [California State Board of Equalization,

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[2] Although a recession was finally acknowledged in May 1980, the first (11-month) decline in economic indicators started in July 1979 [California State Board of Equalization, 1979-80, p. 35]. Personal income growth slowed in the later months of 1979 [Governor of California, 1979]. An increase in interest rates began with a Federal Reserve announcement to tighten monetary policy on October 7, 1979; the discount rate was raised from 11 to 12 percent and the prime lending rate soon moved to 15¾ percent [Governor of California, 1979]. On March 5, 1980, the Federal Reserve announced credit restriction policies and the prime rate soon moved to 20 percent [Governor of California, 1979]. The prime rate remained close to 20 percent from that time through the summer of 1981 [California State Board of Equalization, 1980-81, p. 35].

1979–82] declined precipitously in 1979 and continued to decline through 1982. Since this taxable sales decline occurred while personal incomes increased (as personal savings decreased), the California State Board of Equalization [1981–82, p. 43], estimated that there was a dramatically increased flow of spending into the underground economy, which would have further eroded the corporate income tax base.

Because of the strong possibility of the economic downturn confounding the Proposition 13 intervention, a maintained hypothesis is that this economic downturn did affect the tax collections time series. Accordingly, a second intervention component (in addition to the Proposition 13 intervention) was included in the statistical model.

The Hypothesis

Given that taxpayers, if rational, should quickly and accurately adjust their tax prepayments for the Proposition 13 intervention, the following operational hypothesis is posed:

> H_1: There will be an immediate and permanent increase in aggregate individual and corporate tax prepayments because of Proposition 13.

Aggregate tax collections will be analyzed since data on individual tax returns are unavailable. These aggregate data have the advantage of allowing for heterogeneous expectations among taxpayers, i.e., no assumptions are required with regard to particular individuals' tax rates or their expectations of taxable incomes. The hypothesis generally tests whether equations 8 through 10 from Appendix 1 are true. The hypothesis will be tested operationally using intervention analysis.

II. THE DATA

The original data consist of monthly observations of 1) individual withholding payments, 2) individual estimated tax payments, and 3) corporate tax payments as reported by the California Franchise Tax Board. (Note that federal income tax prepayment data are compiled by the Internal Revenue Service by region but not by state.) The observations cover the period July 1972 through June 1982. Certain effects such as inflation, two (non-Proposition 13) tax changes, and recording irregularities were filtered from the original data in order to obtain suitably stable measures of tax collections for statistical modeling. Without these adjustments, the effects of Proposition 13 would be confounded.

The first adjustment removed the effects of significant (non-Proposition 13) tax changes from the original data. Fortunately, only one such change occurred for each series. For the two individual tax series, the California Legislature indexed tax rates for individuals on July 1, 1978. The effect of indexing on the two individual series was removed by adding the effects of indexing, as estimated by the California Legislative Analyst [1980], to the original series. For the corporation income tax series, the significant tax change was an increase in the corporate tax rate from nine percent to 9.6 percent effective January 1, 1980. Thus, the original series had to be reduced by the amount of this tax increase. An explanation of this adjustment appears in Appendix 2.

Because any changes caused by either of the two interventions are small compared with the dramatic effects of inflation during the period under examination, the second adjustment deflated the three previously adjusted series. The two individual tax series (estimated tax and

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withholding) were deflated using the California consumer price index with 1971 as a base year. The corporate estimated tax series was deflated using the U.S. implicit price GNP deflator index with 1971 as a base year. The deflation factors for the three series are reported in Appendix 2.

To eliminate the effects of recording irregularities, each of the three series was then subjected to a third adjustment. The individual withholding series was adjusted by aggregating the following four sets of two months into four single observations: May-June, August-September, November-December, and February-March. The remaining monthly observations in April, July, October, and January were not aggregated. The aggregated individual withholding series thus had eight observations per year. This aggregation procedure for the individual withholding series was necessary to correct for recording irregularities by the California Employment Development Department (E.D.D.). There is often a timing difference between amounts remitted to the E.D.D. by calendar year-end firms on the due dates of May 31, August 31, November 31, and January 31 and the amounts reported to the Franchise Tax Board (F.T.B.). Estimates by the E.D.D. are necessary since cash must be remitted to the F.T.B. before a final accounting of the estimated payments can be made. Corrections to the original remittances would be made by additional payments or refund requests by the E.D.D. to the F.T.B. in the next month. The due and subsequent month, when combined, thus provided accurate quarterly withholding remittances by calendar year-end withholding firms and greatly reduced variability in the withholding series. Note that no correction procedures were necessary for non-calendar year-end withholding firms which (perhaps because they remitted a very small proportion of total California withholding) lacked the variability in recording which calendar year-end firms suffered.

The individual estimated tax series was adjusted for recording irregularities by aggregating the months of December-January into a single observation. This aggregation was necessary to reduce variability in fourth-quarter payments (which are due in January of the next year for most individuals). These payments are often made in December by individuals desiring to deduct these payments as state taxes on their federal returns for the year then ended. January payments become tax-deductible on the individual's succeeding federal return. Because of changing needs of taxpayers to deduct such payments in either December or January, aggregate fourth-quarter payments vary from year to year. The aggregation of December-January collections by the F.T.B. removed this variability from the individual estimated tax series.

Finally, the adjustment for recording irregularities in the corporation estimated tax payment series involved the formation of two corporate tax series. The first series included only calendar year-end corporations that were primarily multistate; the second group included fiscal year-end corporations operating almost exclusively in California.[3] This dichotomy was necessary since the large

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[3] Support for this lies in the 1980 California Franchise Tax Board *Annual Report* (p. 19) which states that, for 1979 corporations, approximately 26 percent of all corporations were on a calendar-year accounting basis, comprising 60.1 percent of total net profits reported. The 1981 *Annual Report* (p. 19) stated that for 1980 corporations, 5.2 percent apportion their income within and without California (they are multistate), yet these apportioning corporations account for 71.3 percent of total net income reported.

(multistate) corporations had only 15.3 percent of their property in California [State of California Franchise Tax Board, 1981, p. 19], making it possible that large corporations' tax adjustments to Proposition 13 would not be statistically significant since only a small percent of their property tax deductions would be affected by Proposition 13. Since the large corporations far outweighed (in total dollars) the small (California) corporations in the overall corporate series, any significant reaction to Proposition 13 by the small corporations could be confounded by nonreaction by the large corporations.

III. The Intervention Model

The question to be investigated is: "Did the passage of Proposition 13 in June 1978 cause an immediate and permanent change in withholding and estimated tax payments?" A cursory examination of the data might suggest that the Student's *t*-test for the comparison of two means is appropriate for addressing the above question. However, a key assumption of this test is that observations both before and after the passage of Proposition 13 are independently distributed; even a moderate violation of this assumption can cause this test to be extremely misleading. Clearly, the data are time series in which not only are successive observations autocorrelated, but there are also strong seasonal effects. Thus, the use of any statistical procedure (parametric or nonparametric) which assumes independence of the observations is not appropriate for the problem.

One way to assess correctly the impact of Proposition 13 is to build a stochastic model for the data which takes cognizance of possible changes of the form hypothesized above. Such stochastic models are called intervention models. The description of this model is unique to the specific problem. For a more general description of intervention models, the reader is referred to Box and Tiao [1975].

An initial description of the model begins by assuming that the intervention model has at most two exogenous variables. The general form of the model is:

$$z_t=\frac{\omega_1(B)}{\delta_1(B)}\,\xi_{1t}+\frac{\omega_2(B)}{\delta_2(B)}\,\xi_{2t}+\frac{\theta(B)}{\varphi(B)}\,a_t \qquad t=1,2,\ldots,n, \quad (1)$$

where

B = backshift operator

$(B_{zt}=z_{t-1})$,

z_t = value of tax collection series at time t,

a_t = independent random variable distributed as $N(0, \sigma_2)$,

$\theta(B)$ = moving average polynomial for noise model

$(1-\theta_1B-\theta_2B^2-\ldots-\theta B^q)$,

$\varphi(B)$ = autoregressive polynomial for noise model

$(1-\varphi_1B-\varphi_2B-\ldots-\varphi_{p+d}B^{p+d})$,

ξ_{it} = value of ith exogenous variable at time t (zero or one for our problem),

$\omega_i(B)$ = transfer function polynomial numerator of order S for ith exogenous variable $(\omega_{0i}-\omega_{1i}B-\ldots-\omega_{si}B^s)$, and

$\delta_i(B)$ = transfer function polynomial denominator of order r for ith exogenous variable

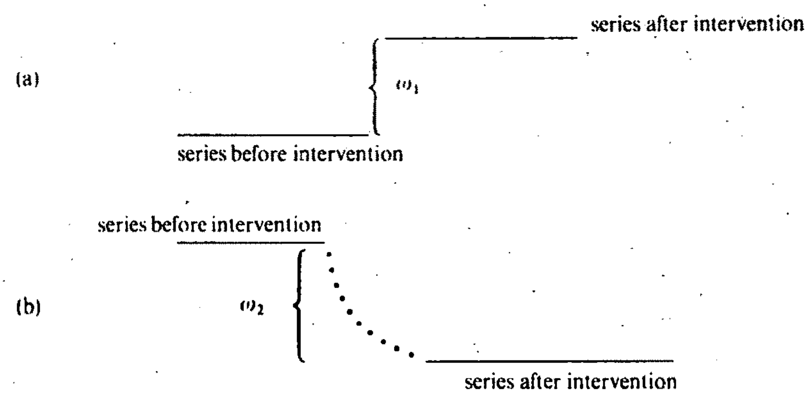
$(1-\delta_{1i}B-\ldots-\delta_{ri}B^r)$.

Note that the roots of $\omega_i(B)$ and $\theta(B)$ must be outside the unit circle and that the roots of $\varphi_i(B)$ and $\delta_i(B)$ must be outside or on the unit circle.

In general, ξ_{it} can be any exogenous time series whose influence needs to be

FIGURE 1

SERIES BEFORE AND AFTER INTERVENTIONS


series after intervention
(a)
ω_1
series before intervention
series before intervention
(b)
ω_2
series after intervention

taken into account. However, in the present context, ξ_{it} is described by a step functions $S_{it}^{(T)}$. To be more explicit, suppose ξ_{1t} is the exogenous variable representing passage of Proposition 13 and ξ_{2t} is the exogenous variable representing dramatic changes in macroeconomic conditions. These exogenous variables are:

$$\xi_{1t}=S_{1t}^{(T)}=\begin{cases}0 & t<\text{June 1978}\\ 1 & t\geq\text{June 1978}\end{cases}$$

$$\xi_{2t}=S_{2t}^{(T)}=\begin{cases}0 & t<\text{July 1979}\\ 1 & t\geq\text{June 1979}\end{cases}$$

The dynamic effects of the two exogenous variables are captured by

$$[\omega_1(B)/\delta_1(B)]S_{1t}^{(T)} \text{ and } [\omega_2(B)/\delta_2(B)]S_{2t}^{(T)}.$$

The prior discussion of the expected impacts of Proposition 13 and the change in macroeconomic conditions suggest the following functional form for the intervention model:

$$z_t=\omega_{01}S_{1t}^{(T)}+\frac{\omega_{02}S_{2t}^{(T)}}{1-\delta B}+N_t, \quad (2)$$

where $N_t=\theta(B)a_t/\varphi(B)$ is the noise model. This functional form is suggested by the expectation of (a) an immediate and permanent change in tax collections as a result of Proposition 13 and (b) a gradual decay in tax collections caused by the change in macroeconomic conditions. Figure (1a) illustrates the expected response to Proposition 13 and Figure (1b) illustrates the expected response to the change in macro-economic conditions.

IV. MODEL BUILDING

The process of building an intervention model is necessarily iterative and, as discussed by Box and Jenkins [1976], entails the successive use of model identification, fitting, and diagnostic checking in establishing the model. Applied in the present context the strategy is as follows:

First frame a model for change, which describes what is expected to occur given passage of Proposition 13; next, work out the appropriate data and analysis based on that model and, if diagnostic checks show no inadequacy in the model form, draw conclusions as to the effect of Proposition 13; but if the model appears to be inadequate, attempt to learn why and repeat the above steps. The results reported below were obtained using this strategy.

Correction for Periodic Mean Behavior

Both the individual withholding and the individual estimated tax series exhibit periodic mean behavior. That is, the level of each series depends upon the particular month of the year being examined. Such behavior is at odds with the standard assumptions of (1), that the mean and autocovariance are time-invariant.

As demonstrated by Tiao and Grupe [1980], such behavior must be filtered adequately from the data if reliable and accurate assessment of the intervention effects are to occur. Grupe [1979] shows that the standard model can be broadened to handle periodic means by centering the series. Using the individual estimated tax series to illustrate this procedure, the centered series, hereafter denoted as $\tilde{z}_t$, is given as:

$$a_t = \tilde{z}_{j+11\tau} - \hat{\mu}_j, \qquad (3a)$$

where $\hat{\mu}_j$ is the estimated mean of the month, $j = 1, 2, \ldots, 11$ is one of the 11 months in the individual estimated tax series, and τ is the year of the centered series.

Fitted Models

For each of the four series, the initial model specification (i.e., functional form) for the intervention model is defined by (2). The final four models are reported below. None of the four models displayed showed obvious inadequacies when subjected to diagnostic checks. Approximate standard errors for the estimated coefficients of the four models are reported beneath the coefficients in parentheses.

The final model for the individual withholding series is

$$(1 - B^2)\tilde{z}_{1t} = \underset{(6.20)}{13.33} S_{1t}^{(T)} + (1 + \underset{(0.11)}{0.66} B)a_{1t}, \qquad (4)$$

where $\tilde{z}_{1t}$ is the centered withholding series as defined by (3). The second exogenous variable is not included in the final model because the coefficient was not significant. The asymptotic Student t-ratio for $\hat{\omega}_{01}$ is 2.15. Thus, there is evidence that Proposition 13 caused an immediate and permanent increase in individual withholding.

The model for individual estimated payments series is

$$(1 - B^{11})\tilde{z}_{2t} = \underset{(2.81)}{8.72} S_{1t}^{(T)} + (1 + \underset{(0.10)}{0.29} B)a_{2t} \qquad (5)$$

where $\tilde{z}_{2t}$ is the centered estimated payment series as defined by (3). As with (4) above, the second exogenous variable is excluded from the final model because it was not significant. The asymptotic Student t-ratio for $\hat{\omega}_{01}$ is 3.10. Thus, there is evidence that Proposition 13 caused an immediate and permanent increase in individual estimated tax payments.

The final intervention model for the small corporation series is

$$(1 - B^4)z_{3t} = \underset{(1.32)}{3.95} S_{1t}^{(T)} - \underset{(2.47)}{8.86} S_{2t}^{(T)} + (1 + \underset{(0.12)}{0.31} B)/(1 + \underset{(0.08)}{0.72} B)a_{3t}, \qquad (6)$$

where z_{3t} is the small corporation tax series after adjustments described above. The asymptotic Student's t-ratios for $\hat{\omega}_{01}$ and $\hat{\omega}_{02}$ are 2.99 and -3.59, respectively. Thus, there is evidence that both Proposition 13 and changes in macroeconomic conditions caused immediate and permanent changes in small corporation estimated tax payments. The permanent changes were increases and decreases, respectively, for the Proposition 13 and macroeconomic interventions.

The final model for the large corporation tax series is

TABLE 2
TESTS OF STRUCTURAL STABILITY

	Q	p-*value*
Individual Withholding (33)	51.70	0.02
Individual Estimated Tax (45)	83.71	0.0001
Corporate Estimated (Large) (17)	15.97	0.53
Corporate Estimated (Small) (33)	55.21	0.01

$$\begin{aligned}(1-B^2)z_{4t} &= \underset{(6.26)}{9.05}S_{1t}^{(T)} - \underset{(7.21)}{15.31}S_{2t}^{(T)} \\ &\quad + (1+\underset{(0.18)}{0.52}B)/(1-\underset{(0.15)}{0.23}B)a_{4t},\end{aligned} \qquad (7)$$

where z_{4t} is the large corporation tax series after adjustments described above. The asymptotic t-ratios for $\hat{\omega}_{01}$ and $\hat{\omega}_{02}$ are 1.45 and -2.12, respectively. Thus, the effect of Proposition 13 on the large corporation tax series is questionable. This questionable effect is probably due to the previously mentioned proportionately insignificant holdings of California property by large corporations. On the other hand, there is evidence that changes in macroeconomic conditions had an effect on the series.

Another Test for Change

To further substantiate claims about the effect of Proposition 13, a test of structural stability set forth in Box and Jenkins [1976] is employed. This test compares forecasts made from some point at which a change supposedly occurred (passage of Proposition 13) with subsequently realized values. If there is no change in the series, Box and Jenkins show that

$$Q = \sum_{j=t+1}^{T+L} \hat{a}_j^2/\hat{\sigma}^2$$

is distributed as a chi-squared random variable with L degrees of freedom where $\hat{a}_j$ is the model residual for period j and $\hat{\sigma}^2$ is the residual mean square error. On the other hand, if a change in the structure of the series occurs, Q is inflated.

The results of this test of structural stability are reported in Table 2. The results suggest that a structure change after passage of Proposition 13 occurred for three of the four series. Only the large corporation estimated series fails to exhibit structural change. Thus, the tests of structural stability corroborate the initial results.

V. CONCLUSIONS

This study demonstrates that individuals and small corporations reacted quickly and accurately to tax law changes. To the extent that this result can be generalized to less prepublicized and/or more complex (having multi-directional effects) tax law changes, several implications are evident for governments and researchers.

One such implication is that the fiscal tax policy mechanism can be relied upon insofar as taxpayers seem capable of quickly and accurately altering their fiscal behavior to tax law changes. Legislators can feel more confident that their intended tax incentives/disincentives will be acted upon rationally by taxpayers. Researchers who analytically or experimentally assume such rationality in their studies may feel more assured of the results of their studies.

Another implication is that government agencies can build this rationality into their cash budgeting decisions.

Specifically, governments can assume that any new tax legislation will be reacted to quickly and accurately. As a result, cash flow forecasting of tax revenues can be improved.

A final implication of the study is that legislators can test the effects of tax law changes assuming taxpayer rationality. That is, if after a law change tax collections do not quickly change, or if they change in an unforeseen direction, then the law may need to be revised. This analysis can either be performed *ex post* or on an experimental basis (using a subset of taxpayers) before the law is fully effective. The method used in this study would be an appropriate way of doing such an analysis.

The aforementioned implications could be embellished by further research. One topic for further research would be to examine the cross-sectional rationality of individual taxpayers. For example, in this study it would be interesting to know who reacted and in what amount to the Proposition 13 intervention. Did most taxpayers react or did only a small number of wealthy individuals have an impact? Market efficiency studies imply that a broad cross-section of individuals can react to such information announcements in a security market setting. Perhaps research methods from the market efficiency studies can help answer this taxpayer question.

Another topic for further research is to determine what proportion of individuals and corporations use exceptions to the underpayment penalties. This study indicates that such exceptions may not be widely used. Further studies should investigate whether such taxpayer behavior is due to partial ignorance of the exceptions, the desire to minimize large year-end tax payments, or because some taxpayers are not qualified to use the exceptions.[4]

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[4] For example, exception 1, tax based on 100 percent of the prior year's tax, can only be used where there was a liability in the prior year. Other specific requirements limit the use of the remaining three exceptions to the underpayment penalty. For a thorough discussion, see Bock [1983].

APPENDIX 1

Model for Taxpayer Behavior

The general model for individual taxation, on an annual basis, can be expressed as:

$$T_{i,t} = Tr_{i,t}(TI_{i,t})$$

where

$$TI_{i,t} = GI_{i,t} - AD_{i,t} - PTID_{i,t} - OID_{i,t},$$

T = income tax payable,
Tr = Effective tax rate ($0 < Tr < 11\%$ under California law),
TI = taxable income,
GI = gross income (subject to taxation),
AD = "above the line" deductions,
PTID = property tax itemized deduction,
OID = other itemized deductions and personal exemptions,

subscript *i* refers to individual *i*, and
subscript *t* refers to year *t*.

Note that the constraint $TI_{i,t} > 0$ must apply since California does not have "net operating loss" carryover/back provisions as under federal laws.

The tax change resulting from Proposition 13's reduction of property taxes can be shown as (on an annual basis):

$$\frac{\partial T_{i,t+p}}{\partial PTID_{i,t+p}} = MTR_{i,t+p}\left(\frac{\partial TI_{i,t+p}}{\partial PTID_{i,t+p}}\right)$$

where MTR is the taxpayer's marginal tax rate and $t+p$ are the periods affected by Proposition 13. The right-hand expression equals zero if the taxpayer does not itemize deductions and is greater than zero if the taxpayer itemizes deductions.

Two forms must be used to describe a model for individual income tax prepayments. For those taxpayers who are subject to withholding, the prepayment model can be expressed as:

$$T_{i,t} = \sum_{j=1}^{52} W_{i,j}$$

which is the sum of weekly withholding ($j = 1$ to 26 for biweekly withholding; $j = 1$ to 12 for monthly withholding).

For individuals subject to estimated tax payments, the prepayment model can be expressed as:

$$T_{i,t} = \sum_{j=1}^{4} E_{i,j}$$

which is the sum of quarterly estimated tax payments.

Prepayment adjustments by individuals to Proposition 13 for individuals subject to withholding is

$$\frac{\partial W_{i,j+p}}{\partial PTID_{i,j+p}}.$$

This expression equals zero for the withholding period before a tax law change and equals

$$MTR\,\frac{\partial TI_{i,j+p}}{\partial PTID_{i,j+p}}$$

after the change.

For individuals subject to estimated tax payments, the prepayment adjustment to Proposition 13 is

$$\frac{\partial E_{i,j+p}}{\partial PTID_{i,j+p}}.$$

This expression equals zero the quarter before the tax change and

$$MTR_{i,t+p}\left(\frac{\partial TI_{i,t+p}}{\partial PTID_{i,t+p}}\right)$$

after the tax change.

If individuals (subject to withholding or estimated payments) accurately adjust their prepayments at the time of the tax change (assuming no exceptions to the underpayment penalty are used) then

$$\mathrm{MTR}_{i,j+p}\left(\frac{\partial^2 \mathrm{TI}_{i,j+p}}{\partial \mathrm{PTID}^2_{i,j+p}}\right) \leq 0,$$

i.e., the function is at a global maximum.

The aggregate individual prepayment tax adjustment is

$$\sum_{ie=1}^{N} \mathrm{MTR}_{ie}\left(\frac{\partial \mathrm{TI}_{ie,j+p}}{\partial \mathrm{PTID}_{ie,j+p}}\right) + \sum_{iw=1}^{N} \mathrm{MTR}_{iw}\left(\frac{\partial \mathrm{TI}_{iw,j+p}}{\partial \mathrm{PTID}_{iw,j+p}}\right)$$

where *ie* subscripts refer to individuals subject to estimated payments and *iw* are individuals subject to withholding.

If, in the aggregate, California individual taxpayers subject to withholding react quickly and accurately to the Proposition 13 intervention, the following two equations should hold:

$$\sum_{iw=1}^{N} \sum_{j=j+p}^{J} \mathrm{MTR}_{iw,j+p} \frac{\partial \mathrm{TI}_{iw,j+p}}{\partial \mathrm{PTD}_{iw,j+p}} > 0 \tag{8a}$$

$$\sum_{iw=1}^{N} \sum_{j=j+p}^{J} \mathrm{MTR}_{iw,j+p} \frac{\partial^2 \mathrm{TI}_{iw,j+p}}{\partial \mathrm{PTD}^2_{iw,j+p}} \leq 0. \tag{8b}$$

If, in the aggregate, California individual taxpayers subject to estimated tax payments react quickly and accurately to the Proposition 13 intervention, the following two equations should hold:

$$\sum_{ie=1}^{N} \sum_{j=j+p}^{J} \mathrm{MTR}_{ie,j+p} \frac{\partial \mathrm{TI}_{ie,j+p}}{\partial \mathrm{PTD}_{ie,j+p}} > 0 \tag{9a}$$

$$\sum_{ie=1}^{N} \sum_{j=j+p}^{J} \mathrm{MTR}_{ie,j+p} \frac{\partial^2 \mathrm{TI}_{ie,j+p}}{\partial \mathrm{PTD}^2_{ie,j+p}} \leq 0. \tag{9b}$$

The general annual model for corporate taxation is

$$\mathrm{T}_{c,t} = \mathrm{TR}_{c,t}(\mathrm{TI}_{c,t}),$$

where

$$\mathrm{TI}_{c,t} = \mathrm{GI}_{c,t} - \mathrm{PTD}_{c,t} - \mathrm{OD}_{c,t},$$

T = tax payable,
Tr = tax rate = 9% for California (9.6% after 1979),
TI = taxable income,
GI = gross income subject to tax,
PTD = property tax deductions,
OD = other deductions,

and subscripts *c,t* refer to corporation *c* in year *t*.

Note that TI is constrained to TI > 0 due to the lack of California law providing for net operating losses, discussed above.

An annual tax change caused by Proposition 13 for a corporation is

$$\frac{\partial T_{c,t+p}}{\partial PTD_{c,t+p}} = \begin{cases} .09\Delta \text{ PTD before 1980.} \\ .096\Delta \text{ PTD after 1979.} \end{cases}$$

The corporate prepayment model is

$$T_{c,t} = \sum_{j=1}^{4} E_{c,j}, \text{ or the sum of quarterly estimated tax payments.}$$

Corporate prepayment adjustments to Proposition 13 are

$$\frac{\partial E_{c,j+p}}{\partial PTD_{c,j+p}} \begin{cases} =0 \text{ the quarter before Proposition 13} \\ =.09\left(\dfrac{\partial TI_{c,j+p}}{\partial PTD_{c,j+p}}\right) \text{after Proposition 13.} \end{cases}$$

If there is an immediate and accurate adjustment of prepayments in response to Proposition 13, then the following should obtain:

$$.09\left(\frac{\partial^2 TI_{c,j+p}}{\partial PTD^2_{c,j+p}}\right) < 0 \text{ i.e., the function is at a global maximum.}$$

Finally, aggregate corporate adjustments can be expressed as:

$$.09\sum_{c=1}^{N} \frac{\partial TI_{c,j+p}}{\partial PTD_{c,j+p}}.$$

If, in the aggregate, California corporations react quickly and accurately to the Proposition 13 intervention, then the following two equations should hold:

$$.09\sum_{c=1}^{N} \sum_{j=j+p}^{J} \frac{\partial TI_{c,j+p}}{\partial PTD_{c,j+p}} > 0 \qquad (10a)$$

$$.09\sum_{c=1}^{N} \sum_{j=j+p}^{J} \frac{\partial^2 TI_{c,j+p}}{\partial PTD^2_{c,j+p}} \leq 0. \qquad (10b)$$

APPENDIX 2

ADJUSTMENTS TO INDIVIDUAL INCOME TAX SERIES

*Total Adjustments**

Year	*Deflator*[1]
1972	.93
1973	.92
1974	.83
1975	.75
1976	.71
1977	.60
1978	.61*
1979	.58*
1980	.53*
1981	.54*
1982	.60*

* Includes "add-back" to reflect indexing of tax law in 1978 as shown below.

Adjustments for Indexing California Tax Law, 1978–1982 ($ Millions)[2]

Year	*Tax Without Indexing*	*Indexing Effect From*		*Total Indexing Effect*	*Less "Over-Withholding"*	*"True" Indexing Effect*	
		AB3802	*AB276*			*Total*	*% Col. 1*
1978	5269	(186)	+	(186)	167	(19)	.4
1979	6741	(581)		(581)	300	(281)	4.2
1980	8140	(1440)	(120)	(1560)	760	(800)	9.8
1981	9650	(2100)	(281)	(2381)	466	(1915)	19.8
1982	11700	(3811)	(376)	(4187)	301	(3886)	33.2

+ One-time special tax credit not included since it would not affect 1978 prepayments.

[1] Based on annual average California CPI.

[2] Source: State of California Legislative Analyst [1980] and California State Assembly Bills 3802 [1978] and 276 [1978].

APPENDIX 2 (CONTINUED)
ADJUSTMENTS TO CORPORATION INCOME TAX SERIES

*Total Adjustments**	
Year	*Deflation***
1972	.961
1973	.908
1974	.828
1975	.755
1976	.718
1977	.677
1978	.631
1979	.580*
1980	.530*
1981	.484*
1982	.457*

* Does not include monthly adjustments for corporate franchise tax increase, effective for calendar year 1980. Effective for calendar year 1980, the rate was raised from nine percent to 9.6 percent. For corporation fiscal years beginning in 1980 or later years, the 9.6 percent applies to the full year (and thus to all estimated tax payments for the year). For fiscal years beginning in 1979 and ending in 1980, however, the 9.6 percent rate was "phased-in." This phase-in was based on the number of months that the corporation had in 1980. Thus, a corporation with its year ending June 30, 1980, would be subject to a 9% + $\frac{6}{12}$ (.6%) = 9.3 percent tax rate. Each of this corporation's estimated payments for the year ended June 30, 1980 would be computed using the 9.3 percent rate.

In a similar fashion, each April 1979 to May 1980 corporation estimated tax payment was adjusted downward to reflect this phase-in. Post phase-in payments were indexed by 9.0/9.6.

** Based on annual average U.S. implicit price GNP deflator.

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Market Reactions to a Non-Discretionary Accounting Change: The Case of Long-Term Investments

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ABSTRACT: It is uncommon for non-discretionary accounting changes to increase reported income. An earlier study by Harrison [1977] concluded that the stock market reacted favorably to such changes. This study reexamines the market's reaction to a change from the cost to the equity method of accounting for long-term investments. Evidence is found to support the view that earnings adjustments precipitated by the change contained new information. However, no market reaction was detected in weeks containing public announcements leading up to and including the Accounting Principles Board's adoption of the change.

1. INTRODUCTION

HARRISON [1977] reported on security price behavior associated with a number of changes in accounting policies. Changes considered were both discretionary and non-discretionary and affected net income both positively and negatively. The change from the cost method of accounting for long-term investments to the equity method dominated the set of non-discretionary changes having a positive earnings effect.[1] For this set of firms Harrison found a significant positive drift in cumulative abnormal returns over a 13-month period encompassing earnings announcements. This study provides further evidence of the security market's reaction to this change.

The approach Harrison employed to measure the security market's reaction involved computing cumulative abnormal returns over a 13-month "window" centered on the first earnings announcements following the change.[2] It was thought that investors would react to the change (if at all) either before earnings announcements in anticipation of the earnings effect or after as a consequence of the earnings effect. The sole event of interest was the announcement of earnings.

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[1] Of 62 firms in this set, 50 were cost to equity adopters.

[2] Rather than use preliminary earnings announcement dates, Harrison merely assumed that such disclosures would be made approximately two months following fiscal year end.

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There are two major weaknesses with this approach. First, there may be other events which cause adjustments of the market's expectations regarding the impact of an accounting change. For example, the market may react at times when an impending change is proposed, revised, approved, or enacted (e.g., Lev [1979], Pfeiffer [1980], Smith [1981], Hughes and Ricks [1984b]).[3] The second weakness is a decrease in statistical power which results from using lengthy time periods to test for market reactions (see Brown and Warner [1980]). Additionally, the requirement that market model parameters be estimated well before (or after) the event of interest both raises a stability issue and makes for inefficient use of available returns data.

One approach for resolving these problems is first to identify the dates when specific public disclosures of events related to the change are made, and then to examine price behavior near to those dates. Basically, the technique is based on the use of dummy variables within market model regressions to extract abnormal returns in short intervals of time surrounding the dates of interest (e.g., Binder [1983], Schipper and Thompson [1983], and Hughes and Ricks [1984b]). Tests are then constructed on the coefficients of those variables. A further advantage of such precise dating is that similar tests can be performed in non-event periods, thereby providing empirical distributions against which event period test statistics can be assessed (e.g., Noreen and Sepe [1981]).

Complementing the emphasis on earnings announcement dates, Harrison set his priors on the directions of market reactions based on how a rational investor might interpret the earnings effect of the accounting change. In particular, he speculated that a positive earnings effect would be viewed as a signal of a conservative bias in the earnings reported before the change, with the result that investors would react positively once that bias was revealed. However, since rational investors would have recognized biases already in reporting practices, it is not clear why the elimination of such biases would have induced a market reaction. The more common view now is that the selection of accounting methods is determined on a basis of contracting efficiency (e.g., Holthausen and Leftwich [1983]).

Finally, although Harrison did allow for differences in market reactions between high systematic risk and low systematic risk firms, much more extensive cross-sectional analysis is possible. The variables often used in such analysis are proxies for the potential effects of accounting changes on contracts that depend on accounting numbers (e.g., Leftwich [1981], Collins, Rozeff, and Dhaliwal [1981], and Bowen, Noreen and Lacey [1981]). As with the tests of market reactions, the significance of the cross-sectional associations found near event dates can also be assessed by reference to empirical distributions of such associations derived from non-event periods.

Sections which follow provide a discussion of the consequences of the accounting change (section 2), an analysis of market reactions to the change (section 3), an analysis of the information content of the change (section 4), and a brief conclusion (section 5). Our results indicate a market reaction only to the preliminary earnings announcements and in proportion to the earnings adjustments required by the change. This reaction is also associated with errors in forecasts of earnings, implying that disclosures resulting from the change had information content.

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[3] In Harrison's study, the time-period over which abnormal returns were measured for most firms did not include the date of approval of the mandated accounting change by the APB (or any earlier event dates).

2. CONSEQUENCES OF THE ACCOUNTING CHANGE

2.1 Contracting Effects

Taking an agency theory perspective, accounting changes which do not affect cash flows directly may, nonetheless, have economic consequences in situations where contracts depend on accounting numbers altered by those changes. The value of the firm may rise or fall and/or be redistributed among the parties involved in contracts which partition that value. Examples of such consequences include the changes in firm value that result from new investment and production decisions induced by the modification of managerial compensation arrangements and the wealth transfers that occur between debt and equity claimants brought about when debt covenants are constructively affected.

A difficulty in assessing the stock market's reactions in this case is that not all of the contracting effects need be in the same direction where stockholders are concerned. Unlike most non-discretionary changes, the switch from the cost to equity method in accounting for long-term investments tended to increase reported income, rather than to decrease it. It is conceivable, therefore, that the change could have reduced the value of the firm by inducing different (and suboptimal) managerial decisions[4] and, at the same time, transferred wealth from debt holders to stockholders by loosening debt restrictions.

If the choice between the cost and equity methods before the accounting change were entirely up to the firm, as Harrison assumed, then it is difficult to understand priors of a net positive market reaction. On the other hand, there are indications that the equity method may not have been universally regarded as an acceptable method of accounting for certain long-term investments prior to the official pronouncement of the Accounting Principles Board (APB).[5] If, constructively, the cost method was required before the change, then share prices could have been affected in either direction.

Even if one could disentangle the different contract effects and sign one's priors, it is not clear that the economic consequences would be of sufficient magnitude to precipitate a discernible market reaction. The earnings adjustments are quite small by comparison to other studies that have detected market reactions to proposed accounting changes.[6] Furthermore, there was little attention paid to this issue in the financial press, perhaps because it was not perceived as having material consequences.[7]

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[4] This assumes that firms had previously self-selected the cost method and negotiated efficient contracts on that basis. Since efficient contracts would have induced mutually preferred decisions before the change, any constructive modification of those contracts would be likely to induce less preferred decisions (or involve costly renegotiation).

[5] Although firms were not explicitly precluded from using the equity method for noncontrolled corporations prior to APB Opinion No. 18, it is possible that they were constrained from using the equity method by the force of existing generally accepted practice. The discussion section of Opinion No. 18 [APB, 1971, pp. 349-350, para. 5] noted that, "while practice varies to some extent, the cost method is generally followed for most investments in noncontrolled corporations . . . . " The cost method was also widely used for unconsolidated foreign subsidiaries. The fact that the cost method was used in the vast majority of such cases suggests that there may have been an implicit requirement for its use.

[6] For example, Collins, Rozeff and Dhaliwal [1981] and Hughes and Ricks [1984b] report average effects on stockholders' equity in the range of 20 percent for changes in oil and gas accounting and retail land sales accounting, respectively. The average here is less than two percent.

[7] Another factor is the possibility that this issue was overshadowed by the policy makers' deliberations on

Given the discussion above, it seems evident that caution should be exercised in specifying alternative hypotheses concerning the nature of market reactions to events related to the accounting change. While in our view contracting effects are likely to be (net) negative or immaterial, we cannot dismiss the possibility that the choice of the cost method before the change was not a free one and, hence, that such effects may have been positive. Accordingly, tests should be two-sided.

2.2 Information Content

An important aspect of the equity method is that it provides for more disclosure than the cost method. Income under the equity method (though not the cost method) includes the investor's share of the undistributed earnings of investee companies. Since this component of income may not have been fully available from other sources before the change, security prices are now conditioned on a different information set.[8] Thus, apart from the contracting effects of the change, there is the further question of whether the added disclosures contained new information in the sense of inducing price changes.

Related to the issue of information content is the extent to which the market was able to anticipate the added disclosures in advance of preliminary earnings announcements. Given that the market was informed of the accounting change well in advance of those announcements, we would expect analysts' earnings forecasts to include estimates of the "equity component" of earnings.[9] Accordingly, analysts' forecasts just prior to earnings announcements provide a measure of the market's ability to predict the earnings impact of the change.

3. MARKET REACTIONS TO CHANGE EVENTS

3.1 Description of Change Events and Sample Data

In all, we uncovered four public disclosures pertaining to the change from the cost to the equity method. The earliest mention of the impending change occurred in a *Wall Street Journal* (WSJ) article on December 16, 1970, which cited the APB's announcement of the proposed change. The next disclosure on March 17, 1971, also in the WSJ, indicated both that adoption was imminent and that the likely effect on earnings was positive. Shortly thereafter an article appeared in Standard and Poor's (S&P's) "Outlook" magazine (March 29, 1971) which provided estimated earnings effects for several affected firms.[10] The APB approved the change as expected the following month; the public announcement of that action was in the WSJ on April 26, 1971.

Given that the progression of public announcements seems to have been steadily toward implementation of the original (and generally non-controversial) proposal, it is unlikely that any one announcement came as much of a surprise. Even if one of the announcements was unanticipated, we are inclined to be-

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marketable securities which were going on at approximately the same time. Evidence of this can be found in the *Wall Street Journal's* index of general news.

[8] Based on a review of 10-K and annual report disclosures for the year prior to the change, only eight of the 75 sample firms provided information which was sufficient to adjust the "cost-based" earnings to "equity-based" earnings. Also, only seven of the 75 firms provided a complete listing of the investee companies.

[9] As mentioned below, S&P reported its forecast revisions in its magazine "Outlook" in March 1971. Eight of our sample firms were listed in that article.

[10] The substance of S&P's article was also reported the following day in the WSJ's "Heard on the Street" column.

lieve that any market reaction would be negative or non-detectable, but in any case not positive as Harrison had hypothesized (provided the use of cost was in fact discretionary before the change).[11]

A fifth event for each firm was its preliminary earnings announcement in the WSJ. Although many firms in our sample reported on a calendar-year basis, these dates did vary across firms over a two-year period, thereby strengthening the likelihood that any systematic reaction detected would be traceable to information contained in those reports.

Firms affected by the accounting change were identified from a review of the 1972 and 1973 Accounting Trends and Techniques.[12] In the two-year period allowed for transition, we found 141 firms that switched from the cost to the equity method. Deleting firms which either did not disclose an earnings effect, or had data missing from CRSP or COMPUSTAT, left 75 firms on which the analysis could be performed. We then computed weekly returns from CRSP for a time span of 208 weeks (January 5, 1970–December 31, 1973), thereby encompassing the four public announcements previously described and the preliminary earnings announcements for all sample firms. In addition, we obtained the following information on each firm from COMPUSTAT and annual reports: market value of equity, debt to equity ratio, current year's earnings effect of the change, and cumulative effect on stockholders' equity (exclusive of the current year's effect).

3.2 *Analysis of Security Returns*

We assume that the returns on the stocks of sample firms were generated by a one-factor market model, modified by a set of dummy variables to capture the transitory effects of events related to the accounting change. (That is, for each event week, we define a variable that takes on a value of one in the event week and zero otherwise.) In more precise terms, we have N regression equations of the form

$$\begin{aligned} R_{it} = \alpha_i + \beta_i R_{mt} + \sum_k \gamma_{ik} P_{kt} \\ + \delta_i E_{it} + u_{it}, \qquad (1) \\ t = 1, 2, \ldots, T, \end{aligned}$$

where

$R_{it} \equiv$ return on the stock of the i^{th} firm in the t^{th} week,

$R_{mt} \equiv$ return on the CRSP value-weighted market index in the t^{th} week,

$P_{kt} \equiv$ dummy variable corresponding to the k^{th} public announcement (excluding the preliminary earnings announcement),

$E_{it} \equiv$ dummy variable corresponding to the preliminary earnings announcement of the i^{th} firm,

$\alpha_i \equiv$ intercept for the i^{th} firm,

$\beta_i \equiv$ measure of systematic (market) risk for the i^{th} firm,

$\gamma_{ik} \equiv$ abnormal return of the i^{th} firm associated with the k^{th} public announcement,

$\delta_i \equiv$ abnormal return of the i^{th} firm, associated with its earnings announcement, and

$u_{it} \equiv$ an $N(0, \sigma_i)$ disturbance term for the i^{th} firm.

Grouping the equations for all N firms, and allowing for contemporaneous cross-correlations, we obtain a model commonly referred to as "seemingly unrelated regressions" (SUR) [Zellner, 1962]. SUR provides a potentially useful generalization over models involving firm-by-firm regressions in cases where it is reasonable to expect that cross-dependencies in returns are not fully extracted by the market factor. Since our sample contains considerable diversification across industries, allowing for cross-correlated disturbances may not be of major importance.[13] Accordingly, we also performed the analysis with the covariance matrix restricted to be diagonal.

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[11] If, as noted in footnote 5, cost was not discretionary, then we are unable to sign our priors.

[12] We selected our sample from *Accounting Trends and Techniques* in part because Harrison used this source, and in part because the (larger) firms more likely to have been significantly affected are included therein. Also, other data bases such as NAARS (i.e., National Automated Accounting Research Service) and Disclosure were not available for this time period.

3.3 Detection of Market Reactions in Event Weeks

To detect market reactions during event weeks, we performed a series of tests, including *F*-tests of the sums of announcement coefficients across firms, a joint *F*-test of the vectors of those coefficients, and *t*-tests of those coefficients firm by firm. (See Theil [1971] for details on the construction and properties of these statistics.) The sums test serves to measure the significance of the average market reaction and, as such, will only detect reactions which are noncancelling. However, while the change increased earnings for 65 sample firms, it decreased earnings for ten. If the market reaction depends on the sign of the income effect, then the power of this test is reduced. Even if the income effects were one-sided, it is not clear (see subsection 2.1) that the market reaction would also be one-sided, given the several possibilities as to what may be driving that reaction. Thus, joint tests across firms and marginal tests firm by firm were also performed.

A difficulty with the joint tests in the unrestricted case is that computed *F*-values are only asymptotically *F* under the null hypothesis and are strongly biased against that hypothesis for finite samples (see Meisner [1979]).[14] In the restricted case, computed *F*-values for neither the sums tests nor the joint tests are even asymptotically *F* unless covariance terms are in fact zero. If covariance terms are zero, computed *F*-values in the restricted case are distributed exactly *F*.[15]

Another approach to constructing joint tests on market reactions to the common events is to omit the dummy variables corresponding to individual preliminary earnings announcements and compute an *F*-statistic defined by Rao [1973]. The advantage of this test statistic is that it is distributed exactly *F* without imposing restrictive assumptions on the covariance matrix. Moreover, the disadvantage of implicitly assuming that the omitted variables don't matter is fairly mild, given that the estimated coefficients for the variables that remain are only negligibly affected.

Computed *F*-values for the SUR sums test are also only asymptotically *F* in the unrestricted case when the firm-specific variables are included. However, when

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[13] Another potential source of contemporaneous cross-correlations is firm size. Given that sample firms tend to be large, there is some chance that the size effect empirically detected by Keim [1983] and others could induce such correlations.

[14] While Meisner [1979] demonstrates the existence of the bias against the null for joint *F*-tests, the assumptions of his simulation are not well approximated by our data. On the other hand, in a study similar to ours, Hughes and Ricks [1984b] show the presence of the bias empirically by comparing results of the *F*-test we employ with the results of an alternative *F*-test not subject to bias (discussed shortly). Their analysis is not quite appropriate as a benchmark, since they have identical explanatory variables across firms, while we do not (recall that the dummy variables corresponding to preliminary earnings announcement dates vary by firm). Nonetheless, for a ratio of cross-sections (firms) to time-series observations of ¼ (compared to our ⅓), the biased *F*-tests reject greater than three times more frequently than the unbiased tests at the five-percent level.

[15] Average cross-correlations by firms range from −.02 to .06, with a grand average of .024.

TABLE 1

F-TESTS OF ABNORMAL RETURNS DURING PUBLIC ANNOUNCEMENT WEEKS

	Event Weeks				
	Change Proposed (12/16/70) $\gamma 1$	*Change Likely (3/17/71)* $\gamma 2$	*Estimated Effects (3/29&30/71)* $\gamma 3$	*Change Approved (4/26/71)* $\gamma 4$	*Earnings Reported (Various)*[a] δ
Panel A: Full Covariance Matrix					
Average Abnormal Returns	.0034	−.0032	.0041	.0015	.0086
F-Value, SUR Sums Test	.192	.168	.282	.039	5.654
Probability of *F*	(.661)	(.682)	(.595)	(.843)	(.017)
F-Value, Joint SUR Test	1.602	3.273	1.722	1.837	2.483
Probability of *F*	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Panel B: Diagonal Covariance Matrix					
Average Abnormal Returns	.0034	−.0032	.0041	.0015	.0084
F-Value, SUR Sums Test	.535	.466	.783	.109	3.245
Probability of *F*	(.465)	(.495)	(.376)	(.741)	(.072)
F-Value, Joint SUR Test	1.163	1.515	.792	.897	1.453
Probability of *F*	(.159)	(.003)	(.906)	(.725)	(.007)
Panel C: Identical Explanatory Variables					
Average Abnormal Returns	.0033	−.0035	.0040	.0015	
F-Value, SUR Sums Test	.188	.170	.278	.037	
Probability of *F*	(.665)	(.680)	(.598)	(.847)	
F-Value, Rao Test	1.005	2.092	1.069	1.141	
Probability of *F*	(.483)	(<.001)	(.367)	(.254)	

[a] Not applicable for Panel C in that the construction of these tests required the deletion of the firm-specific variables corresponding to preliminary earnings announcement weeks.

those variables are deleted, aside from the omitted variables problem, the computed *F*-values are exactly *F*.[16] Since in our case deleting the earnings announcement variables has little effect on estimates of remaining parameters, the potential bias for finite samples with all variables included appears to be slight.

Table 1 presents the results of the SUR *F*-tests for both full and diagonal covariance matrices (Panels A and B, respectively) by event, as well as the SUR *F*-test of sums and the joint Rao *F*-test for the model with the reduced set of variables (Panel C). The only event with a sum (or average) of abnormal returns significantly different from zero is the preliminary earnings announcement (at the five-percent level when the full covariance matrix is used and at the ten-percent level when the diagonal covariance matrix is used). While the joint SUR *F*-tests indicate significance at the five-percent level for every event when the full covariance matrix is used, only the second event ("change likely") and the preliminary earnings announcement produce significant *F*-values when the co-

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[16] This has been shown by both Schipper and Thompson [1984a] and Hughes and Ricks [1984a].

TABLE 2

SUMMARY OF FIRM-BY-FIRM SUR t-TESTS OF ABNORMAL RETURNS DURING PUBLIC ANNOUNCEMENT WEEKS

		Frequencies of Significant t-Values			
		(at 5% level, two-sided)		*(at 10% level, two-sided)*	
		Sign of Abnormal Return		*Sign of Abnormal Return*	
Events:		+	-	+	-
Panel A: Positive Earnings Adjustments (65 firms)					
Change Proposed	$\gamma 1$	3	0	4	1
Change Likely	$\gamma 2$	2	3	4	5
Estimated Effects	$\gamma 3$	1	0	2	1
Change Approved	$\gamma 4$	3	1	3	2
Earnings Reported	δ	8	2	12	6
Panel B: Negative Earnings Adjustments (10 firms)					
Change Proposed	$\gamma 1$	0	0	1	0
Change Likely	$\gamma 2$	0	1	0	1
Estimated Effects	$\gamma 3$	0	0	0	0
Change Approved	$\gamma 4$	0	0	0	1
Earnings Reported	δ	1	0	1	0

variance matrix is restricted to be diagonal. The second event is also the only significant common event when the Rao F-test is employed.

For the sums test we place more credence on the F-test when the covariance matrix is unrestricted, or when the firm-specific variables are deleted. While biases still exist, a comparison of sums tests in Panels A and C suggest they may not be great. Nevertheless, whether we restrict the covariance matrix or not, the preliminary earnings announcement is the only event accompanied by a significant average market reaction. The joint tests are flawed regardless of which alternative we choose. But, given the low average estimated cross-correlations of disturbances[17] and the negligible effect of omitting firm-specific variables, we are inclined to rely more on the restricted joint SUR tests and the Rao tests than on the unrestricted joint SUR tests.

The firm-by-firm t-tests are summarized in Table 2; results on the 65 firms with positive earnings adjustments are in Panel A, and results on the ten firms with negative earnings adjustments are in Panel B. The event with the highest frequency of significant coefficients is the preliminary earnings announcement. For this event, 11 firms have t-values significant at the five-percent level (two-sided), most with positive coefficients (9). Of the 65 firms with positive earnings adjustments (Panel A), eight have significant positive coefficients, suggesting that abnormal returns near

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[17] If cross-correlations are zero, then SUR is convenient (e.g., it facilitates the construction of tests), but it provides no statistical advantages over ordinary least squares applied firm by firm. Since we don't know cross-correlations are zero, we perform the analysis with the covariance matrix restricted and unrestricted and compare findings.

TABLE 3
DESCRIPTIVE STATISTICS FOR ACCOUNTING VARIABLES

	Accounting Variables			
	CY	*SE*	*DE*	*FS*
	Current Year Earnings Effect (%)	*Restatement Effect on Equity (%)*	*Book Value of Debt/Market Value of Equity*	*Market Value of Equity (in millions)*
Panel A: Summary Statistics				
Mean/Mean Absolute Value	3.1/5.0	1.3/1.4	.42	919
Median/Median Absolute Value	2.3/3.4	.3/.5	.34	460
Standard Deviation	6.5	2.8	.40	1441
Panel B: Correlation Coefficients (two-sided significance level)				
CY	1.00	.186 (.110)	-.023 (.843)	-.038 (.745)
SE		1.00	-.134 (.252)	.075 (.524)
DE			1.00	-.225 (.053)
FS				1.00

the earnings announcements were associated in sign with the earnings impact of the change. None of the other events are accompanied by definitive results.

We also ran the SUR sums test using a single dummy variable to capture all four common announcements (excluding the preliminary earnings announcement) and still failed to detect a significant average market reaction. We then used a dummy variable to pick up the cumulative abnormal returns throughout March and April of 1971 (a total of nine weeks) and again could not reject the null on the SUR sums test.

At this stage, it would appear that any systematic market reaction was essentially limited to the preliminary earnings announcement week and tended to be in the same direction as the effect of the accounting change on earnings.

3.4 Association of Abnormal Returns with the Impact of the Change

Next, to make inferences about what is driving market reactions in event weeks, we performed an analysis of the cross-sectional association between abnormal returns and the following variables: the percentage change in current year's earnings resulting from the change (CY), the percentage restatement effect on stockholders' equity (SE), the debt-equity ratio (DE), and the market value of equity as a measure of firm size (FS).[18] Similar to previously cited

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[18] In more precise terms, CY is the equity in earnings of affiliates less dividends for the current year, divided by what earnings of sample firms would have been if the change had not occurred. Similarly, SE is the cumulative effect of earnings restatements, divided by what stockholder's equity would have been if the change had not occurred. DE is long-term debt, divided by the

TABLE 4

CORRELATIONS BETWEEN ABNORMAL RETURNS IN EVENT WEEKS AND PROXY VARIABLES

	Events									
	Change Proposed γ_1		*Change Likely* γ_2		*Estimated Effect* γ_3		*Change Approved* γ_4		*Earnings Announced* δ	
Variables	*PPM*	*SRO*	*PPM*	*SRO*	*PPM*	*SRO*	*PPM*	*SRO*	*PPM*	*SRO*
Current Year's Earnings Effect (CY)	−.045	.036	.067	.103	.148	.087	.118	.154	.370	.401
	(.702)	(.759)	(.566)	(.378)	(.204)	(.456)	(.314)	(.186)	(.002)	(<.001)
Restatement of Stockholders' Equity (SE)	.011	.152	.078	.229	−.069	−.175	.223	.139	.126	.191
	(.923)	(.192)	(.507)	(.048)	(.555)	(.132)	(.054)	(.234)	(.280)	(.101)
Debt-Equity Ratio (DE)	.026	.054	.325	.105	.042	.033	−.025	.029	.019	.017
	(.822)	(.646)	(.004)	(.372)	(.718)	(.780)	(.831)	(.802)	(.867)	(.884)
Firm Size (FS)	−.073	−.059	−.074	−.134	−.158	−.189	−.031	−.016	−.113	−.198
	(.534)	(.614)	(.629)	(.250)	(.175)	(.105)	(.791)	(.891)	(.334)	(.088)

Note: The non-bracketed figures are the estimated correlation coefficients (PPM refers to Pearson product moment and SRO refers to Spearman rank order) and the bracketed figures are the probabilities of those estimates under the null hypothesis using a two-sided test.

studies, we assume that these variables reflect the impact of the accounting change on the various contractual relationships that depend on accounting numbers.[19] In addition, by performing a similar analysis in non-event weeks, we obtain empirical distributions of measures of association against which the significance of such measures in event weeks can be assessed.

Descriptive statistics for the four variables appear in Table 3. As noted earlier, the mean and median percentage effects of the change on stockholders' equity and on current year's earnings are small in comparison to analogous effects of other accounting changes which have been found to produce significant market reactions. Also, the relative lack of significant intervariable correlations suggests that multicollinearity should not be a major problem in the cross-sectional analysis.

Table 4 reports correlations (both Pearson product moment (PPM) and Spearman rank order (SRO)) between the explanatory variables and abnormal returns during announcement weeks. An advantage of SRO correlations is that they place weaker demands on the data by relying only on their ordinal properties. This is especially useful in our study, given the ambiguity in theorized relationships discussed earlier.

The only significant relationship (at five percent or better) for both types of correlations is between the current year's

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market value of stockholder's equity (both at the start of the change year). FS is market value of stockholder's equity (at the start of the change year).

[19] For example, Collins, Rozeff and Dhaliwal [1981] employ all four of these variables, and Hughes and Ricks [1984b] make use of the last three. The variables CY and SE capture the general impact of the changes on accounting numbers that often appear in debt and management contracts. Wealth transfer arguments motivate the inclusion of DE (e.g., Leftwich [1981]), while FS is included to proxy for "political costs" (see Watts and Zimmerman [1978]).

earnings effect (CY) and abnormal returns during the earnings announcement week. The fact that this association is positive indicates that market reactions to the earnings announcements were in the same direction as the earnings effect of the accounting change.[20] Two other relationships (γ_2 with SE and γ_2 with DE) are significant for one of the two types of correlations, but do not approach significance for the other type of correlation.

The cross-sectional analysis was also performed using the same accumulations of abnormal returns tested earlier for average market reactions. Using either the coefficients of a single dummy variable for the four public announcements combined, or the coefficients of a single dummy variable to pick up all of March and April of 1971 (nine weeks), the cross-sectional analysis still produced the same basic result: No relationship was significant for both correlation measures.[21]

Finally, to allow for interrelationships among proxy variables, we ran ordinary least squares regressions using all possible combinations of the four proxy variables as explanatory variables for the abnormal returns of each event. The regression results were generally consistent with the results of the Pearson product moment correlations: The only significant *t*-values were for debt/equity (DE) during the week of the second public announcement ("change likely") and the current year's earnings effect (CY) during the week of the preliminary earnings announcement.

The only relationship which is significant in all cross-sectional tests is the positive association between the earnings effects of the change and abnormal returns during the earnings announcement weeks. We now turn to further analysis of that relationship.

3.5 Further Cross-Sectional Analysis

The weeks surrounding the preliminary earnings announcement weeks (in report time now rather than calendar time) were used to assess the relative significance of the association between the current year's earnings effect (CY) and abnormal returns during the announcement week. Specifically, we correlated CY with weekly abnormal returns for each of 110 weeks surrounding the preliminary earnings announcements of the sample firms (72 weeks prior and 37 weeks following).[22] The results are summarized in Table 5.

Both the parametric (PPM) and non-parametric (SRO) correlations (between CY and abnormal returns) are higher in the preliminary earnings announcement week than in any other week. In non-announcement weeks, the null hypothesis of zero correlation is rejected at about the expected frequencies (for rejection due to chance) using non-parametric correlations, and at somewhat above expected frequencies using parametric correlations.

To investigate the importance of precisely dating the earnings announcements, we considered the correlations between the current year's earnings effect and abnormal returns for wider "windows" around the announcement

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[20] We also ran the SUR and cross-sectional analysis in a combined fashion using the current year's earnings effect (CY) in place of the ones in the dummy variables corresponding to the preliminary earnings announcement dates. The coefficient for that variable was positive and significant at the five-percent level (as expected).

[21] The only significant relationship (at five percent or better) was a positive parametric correlation between debt/equity ratios and the four-week return measure.

[22] Estimates of abnormal returns were obtained from the residuals of market model regressions over the full 208 weeks. The 110-week period represents the largest "window" (surrounding the various preliminary earnings weeks) that could be constructed from the available 208 weeks of returns.

TABLE 5

COMPARISON OF CROSS-SECTIONAL CORRELATION ANALYSIS BETWEEN PRELIMINARY EARNINGS WEEKS AND OTHER WEEKS

Correlation of Abnormal Returns[a] and Current Year's Earnings Effect (CY)	*PPM*	*SRO*
Preliminary Earnings Announcement Week:		
Correlation Coefficient	.445	.386
Probability	(<.001)	(<.001)
Rank (out of 110 weeks)	1	1
Other Weeks:		
Number of Times Significant[b]		
at one-percent level	5	0
at five-percent level	10	6

[a] Estimated from residuals of market model regressions over 208-week periods.
[b] Using two-sided tests.

date. As shown in Table 6 (Panel A), accumulating abnormal returns over increasingly larger windows results in diminishing significance for the correlations of those cumulative abnormal returns with CY beyond two weeks to either side of the announcement week. Although the coefficients are increasing through the five-week window, only one of the correlations for individual weeks other than the announcement week is significant at the five-percent level (i.e., the second week after the announcement week). Significance at the five-percent level is lost for windows larger than nine weeks. If, instead, we accumulate returns only over weeks prior to the preliminary earnings announcement week (Panel B), significance at the five-percent level is lost for windows larger than six weeks.

Lastly, we selected as a subsample those firms with a percentage increase in current year's earnings of greater than five percent (21 firms) and replicated the SUR sums test (of average abnormal returns significantly different from zero) for the preliminary earnings announcement week. The results are indicated in Table 7. This table reveals that isolating on a subsample of firms most affected by the change (in terms of current year's earnings adjustments) considerably strengthens the earlier findings.

Thus, it appears that the market did react to the preliminary earnings announcements consistent with the relative magnitude and direction of the current year's earnings effect of the accounting change. Next, we consider the possibility that such a reaction occurred because the earnings effect of the change constituted new information not well anticipated by the market before those announcements took place.

4. INFORMATION CONTENT ANALYSIS

4.1 Revision of Analyst's Forecasts

As mentioned earlier (Section 3.1), S&P revised its forecasts of earnings per share in anticipation of the accounting change (at least for some firms). Of the eight sample firms included in the article

TABLE 6

CORRELATIONS OF CUMULATIVE ABNORMAL RETURNS OVER VARIOUS TIME PERIODS WITH CURRENT YEAR'S EARNINGS EFFECTS (CY)

	Number of Weeks	*Correlation Coefficients*[a] *PPM*	 *SRO*
Panel A: Weeks Surrounding Preliminary Earnings Announcements (Centered on the "Preliminary" Week			
	1	.445 (<.001)	.386 (<.001)
	3	.445 (<.001)	.427 (<.001)
	5	.507 (<.001)	.485 (<.001)
	7	.382 (<.001)	.353 (.002)
	9	.199 (.087)	.273 (.018)
	11	.201 (.083)	.192 (.099)
	13	.033 (.781)	.066 (.573)
Panel B: Weeks up to and Including Preliminary Earnings Announcements			
	1	.445 (<.001)	.386 (<.001)
	2	.436 (<.001)	.381 (<.001)
	3	.447 (<.001)	.472 (<.001)
	4	.373 (.001)	.345 (.002)
	5	.236 (.041)	.225 (.052)
	6	.281 (.015)	.206 (.077)
	7	.010 (.932)	.019 (.869)
	8	.101 (.382)	.021 (.858)
	9	.085 (.469)	.008 (.945)
	10	.084 (.473)	.052 (.657)

[a] Non-bracketed figures are the correlation coefficients (PPM for Pearson product moment and SRO for Spearman rank order) and bracketed figures are probabilities of those estimates under the null hypothesis using two-sided tests.

TABLE 7

ANALYSIS USING FIRMS WITH CURRENT YEAR EARNINGS ADJUSTMENTS (CY) EXCEEDING FIVE PERCENT (21 FIRMS)

Average Current Year's Earnings Effect	.097
Average Abnormal Return (SUR Coefficient) During Preliminary Earnings Announcement Week	.03
SUR Sums Test:	
F-Value	11.114
Probability	(<.001)
Ranking of the Above Average Abnormal Return Over 110 Surrounding Weeks	1

cited, S&P's estimates of the effect of the change were too high in five cases and too low in three. The errors in those estimates ranged from 23 percent to 155 percent, with an average error of 80 percent. Errors this large are not surprising given the time lag of several months or more between the S&P article and the earnings reports of the firms involved. However, the more interesting question is whether forecasts closer to the preliminary earnings announcement dates systematically differed from actual earnings per share.

Using the S&P *Earnings Forecaster* (updated weekly), we obtained the latest forecasts of annual earnings per share prior to the preliminary earnings announcements. Percentage forecast errors were computed by subtracting forecasts from actual earnings per share (EPS) and dividing the differences by the forecasts. We first compared the S&P forecasts to two different values: (1) reported (equity-basis) EPS, and (2) EPS that would have been reported in the absence of the accounting change (cost-basis). This procedure yielded an "equity-basis" forecast error and a "cost-basis" forecast error for each sample firm.[23]

As shown in Table 8, the average equity-basis forecast error is 2.7 percent (significant at better than a one-percent level), while the average cost-basis forecast error is −1.8 percent (significant at the two-percent level). Hence, average forecasts fell somewhere between actual earnings on a cost basis and actual earnings on an equity basis, implying that S&P analysts had underestimated the impact of the accounting change.

Correlations between current year's earnings effects (CY), forecast errors, and abnormal returns are reported in Table 9. The implication from Table 8 that forecasts were revised for part, but not all, of the current year's earnings effects is further supported by a significant positive coefficient between CY and equity-basis forecast errors and a significant negative coefficient between CY and cost-basis forecast errors.[24]

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[23] In testing the bias in these forecast errors (Table 8), the sign of the forecast error was reversed for the ten firms with negative current year's earnings effects. This was necessary for consistency in that a negative forecast error for these ten firms would have the same implication as a positive forecast error for the other 65 firms (i.e., in both cases the implication is that S&P underestimated the earnings impact of the accounting change). The analysis was also conducted separately for the 65 firms with positive current year's earnings effects. As with the entire sample of 75 firms, the S&P forecast was greater than the "cost-based" EPS and less than the "equity-based" EPS (and significantly different from both at .01 or better).

[24] We can not state definitively that forecast errors were caused by mis-estimates of the impact of the accounting change. However, the likelihood seems small that some other unidentified factor could have produced a systematic forecast error across firms selected only on a basis of the common presence of a nonindustry-specific accounting change.

TABLE 8

TESTS OF AVERAGE FORECAST ERRORS

	Average Forecast Errors	
	Actual Earnings on an Equity Basis	*Actual Earnings on a Cost Basis*
Mean	.027	−.018
t-Value	3.51	−2.31
prob > t[a]	(<.01)	(.02)

[a] Similar significance levels were found employing nonparametric tests.

TABLE 9

CORRELATIONS BETWEEN FORECAST ERRORS, CURRENT YEAR'S EARNINGS EFFECT (CY) AND ABNORMAL RETURNS DURING PRELIMINARY ANNOUNCEMENT WEEKS

	Current Year Earnings Effect		*Estimated (SUR) Abnormal Returns*	
	PPM	*SRO*	*PPM*	*SRO*
Equity-Basis Forecast Errors	.523 (<.001)	.318 (.005)	.222 (.056)	.281 (.015)
Cost-Basis Forecast Errors	−.227 (.050)	−.421 (<.001)	−.113 (.335)	−.137 (.243)
Current Year's Earnings Effect			.370 (.002)	.401 (<.001)

Note: The non-bracketed figures are the estimated correlation coefficients (PPM refers to Pearson product moment and SRO refers to Spearman rank order) and the bracketed figures are the probabilities of those estimates under the null hypothesis using two-sided tests.

4.2 Association of Market Reaction with Current Year's Earnings Effects

If the market reactions during announcement weeks were due to the information content of the added disclosures resulting from the change, then we would expect abnormal returns in those weeks, as well as equity-basis forecast errors, to be positively associated with current year earnings effects (CY).

As shown in Table 9, these variables are, in fact, significantly and positively correlated. While such correlations are consistent with the hypothesis that CY has information content in the sense of driving those returns, this is not the only possibility. If the earnings of sample firms *per se* (i.e., excluding affiliate earnings) were correlated with earnings of their affiliates, then it is also possible that CY had no information content, and merely served as a proxy for the unexpected portion of cost-basis earnings.[25] The negative correlation between forecast errors computed on a cost-basis

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[25] Unfortunately, it was not practical to estimate earnings correlations directly. Little information on affiliate earnings was available prior to the change, and the set of affiliates for many sample firms was subject to frequent change.

TABLE 10

PROFILE OF TYPES OF DISCLOSURES CONCERNING CHANGE TO EQUITY METHOD

Type of Disclosure	*Number of Sample Firms*
1. Earnings Effects of Change to Equity Method	9
2. Indication of Restatement for Change to Equity Method	25
3. Indication of Restatement for Unidentified Change	13
Sub-total	47
4. No Indication of Either Change to Equity or Restatement	28
Total	75

and abnormal returns tends to argue against this possibility; however, the coefficient is not significant.[26]

Additionally, we regressed abnormal returns on both CY and cost-basis forecast errors. The coefficient of CY was positive and highly significant, whereas the coefficient of cost-basis forecast errors was statistically indistinguishable from zero. Again, while these results are consistent with the hypothesis of information content for CY, we are still unable to rule out fully the competing hypothesis of collinearity in earnings.

Another possibility as to what may be causing abnormal returns is the announcement of dividends near to the time of preliminary earnings announcements. In this connection we examined all announcements appearing in the WSJ index of corporate events during the week containing the preliminary earnings announcement for each sample firm. The examination revealed that only 14 (out of 75) sample firms announced dividends during the same week as earnings.[27] Accordingly, we can eliminate such announcements as an explanation for our findings.[28]

Yet another alternative to information content for CY is that the market overreacted to the earnings announcement. Having underestimated the current year's effect of the accounting change, it is conceivable that the market misinterpreted the forecast errors as news unrelated to CY. To assess the potential for the market's confusion as to what may have been contributing to forecast errors, we constructed a profile of the types of disclosures that sample firms actually made. As shown in Table 10, nearly two-thirds of our sample firms made mention of a restatement. However, less than one-half indicated a restatement resulting from change to the

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[26] A combination of a positive correlation between abnormal returns and equity-basis forecast errors, and a negative correlation between abnormal returns and cost-basis forecast errors, is consistent with a dependency of abnormal returns on unexpected affiliate earnings. Conversely, we are unable to determine a reasonable set of conditions under which abnormal returns do not depend on unexpected affiliate earnings *and* yet are negatively correlated with cost-basis forecast errors.

[27] In none of the 14 announcements was it indicated that the dividend had been either increased or decreased.

[28] We can also eliminate other non-earnings announcements. Just three firms made announcements other than those pertaining to earnings or dividends in the preliminary earnings announcement week.

TABLE 11

TESTS FOR REVERSALS IN ABNORMAL RETURNS

Week(s) After Announcement	*Weekly Abnormal Returns*[a]		*Cumulative Abnormal Returns*[a]	
	PPM	*SRO*	*PPM*	*SRO*
Panel A: Correlations Between CY and Abnormal Returns in Subsequent Weeks				
1	.128	.219	.128	.219
	(.274)	(.059)	(.274)	(.059)
2	.359	.209	.303	.241
	(.002)	(.071)	(.008)	(.037)
3	-.111	-.154	.166	.166
	(.345)	(.187)	(.153)	(.154)
4	-.182	.120	.046	.152
	(.117)	(.305)	(.695)	(.192)
5	-.100	-.158	-.002	.018
	(.392)	(.176)	(.989)	(.879)
6	.140	.114	.055	.091
	(.229)	(.332)	(.637)	(.440)
7	.086	.036	.079	.086
	(.463)	(.759)	(.500)	(.463)
8	.005	.029	.079	.078
	(.967)	(.800)	(.500)	(.505)
Panel B: Correlations Between Announcement Week Abnormal Returns and Abnormal Returns in Subsequent Weeks				
1	.039	-.008	.039	-.008
	(.737)	(.945)	(.737)	(.945)
2	.125	.143	.103	.081
	(.284)	(.221)	(.381)	(.491)
3	.020	-.006	.094	.103
	(.866)	(.957)	(.424)	(.379)
4	-.053	.082	.053	.079
	(.652)	(.486)	(.654)	(.500)
5	-.134	-.190	-.010	-.041
	(.251)	(.103)	(.392)	(.723)
6	.198	.207	.070	.088
	(.089)	(.075)	(.548)	(.453)
7	.079	.082	.089	.101
	(.502)	(.482)	(.445)	(.390)
8	-.143	-.146	.036	.057
	(.221)	(.211)	(.760)	(.627)

[a] The parenthetical numbers are probabilities of values greater than those shown (two-sided tests).

equity method, and just nine firms reported the numerical effect of such a change.

If the market had misinterpreted the source of forecast errors, then we might expect to find a reversal effect in abnormal returns in the weeks following the announcement date. Table 11 pro-

TABLE 11 *(Continued)*

Week(s) After Announcement	*Weekly Abnormal Returns*[b]	*Cumulative Abnormal Returns*[b]
Panel C: Average Abnormal Returns for 21 Firms with Largest CY		
1	.007 (.722)	.007 (.722)
2	.009 (.930)	.017 (1.168)
3	−.000 (−.021)	.017 (.942)
4	−.004 (−.349)	.013 (.641)
5	−.016 (−1.557)	−.003 (−.123)
6	.001 (.058)	−.002 (−.088)
7	.009 (.865)	.007 (.245)
8	−.000 (−.017)	.006 (.223)

[b] The parenthetical numbers are t-values, none of which are significant at the five-percent level.

vides the results of tests of such reversals. In Panel A, we report correlations between CY and both weekly and cumulative weekly abnormal returns for up to eight weeks following preliminary earnings announcements. Panel B is similar to Panel A except that we replace CY with the abnormal return in the announcement week. Lastly, in Panel C we report t-values for both weekly and cumulative abnormal returns for the 21 firms with the largest CY values. In no instance do we observe a significant negative correlation coefficient or t-value, a finding that runs counter to the view that the market overreacted as a result of misunderstanding the source of the forecast errors.

Allowing that CY does have information content, it remains to explain why. Our inability to detect market reactions in anticipation of the change reduces the likelihood that the change *per se* was perceived to have economic consequences for affected firms. Rather, the more acceptable explanation is that the equity method provided information concerning affiliate earnings not previously available from other sources. The principal difficulty in substantiating such a conjecture is simply a paucity of information concerning who the affiliates were and where further disclosures might have been found. Although it was commonplace for firms to disclose unconsolidated subsidiaries in SEC 10-K reports, the same was not true for companies in which the ownership interest was less than 50 percent (recall footnote 8).

Although the evidence of association between market reactions to earnings announcements and the current year's earnings effect of the change falls short of implying causality, it seems reasonable to conclude that disclosures accompanying the change in accounting provided new information concerning affiliate earnings not readily available from other sources.

5. CONCLUSION

If the non-discretionary change from the cost method of accounting for long-term investments had produced significant economic consequences and if the market was able to anticipate the adjustments of accounting numbers, then we would expect to observe a market reaction on or about the dates of public announcements related to that change. Our inability to detect such reactions may be due either to the absence of such economic consequences, to the market's inability to predict accurately the adjustments that would ensue, or to the omission of relevant events. In any case, we find no evidence of market reactions to announcements leading up to the accounting change.

On the other hand, we find considerable support for the hypothesis that the market reacted to the new information contained in the added disclosures resulting from the change. Not only is the average estimated abnormal return significantly positive in the preliminary earnings announcement week, but there is also a significant positive cross-sectional association between those returns, analysts' forecast errors, and the current year's earnings effects. These findings are reinforced by comparisons between the results of tests in announcement weeks and the results of similar tests in non-announcement weeks.

An explanation for why the market may have found the current year's earnings effects of the change to have information content is that few data were available from which the market could form its expectations about affiliate earnings. The lack of data could also be used to argue that the market reactions were a consequence of misinterpreting the source of forecast errors. However, this would suggest a reversal effect which we do not find.

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An Induced Theory of Accounting Measurement

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ABSTRACT: This paper addresses a wide gap in the literature of accounting: the absence of a descriptive theory of accounting measurement. It begins with a review of accounting practices aimed at finding what accounting attempts to measure. It goes on to examine specific measurement practices to ascertain what measurement methods are used and the qualities characterizing those methods. Finally, the paper seeks a central idea that explains the bulk of accounting measurement practices. The method employed is empirical and inductive. The results range from the obvious to the surprising. Accounting measurements focus on aspects of wealth. Eight general measurement methods are used to varying extents. The qualities most frequently associated with those methods and the resulting measurements are stability of the income statement line item involved, conservatism, and flexibility and control of income measurement by management. The common thread that holds GAAP measurement practices together is the notion of market simulation; in the absence of observable current market prices for setting-specific assets and liabilities, accounting simulates such prices by selecting and blending pertinent observed market prices and other evidence in accordance with accepted principles of market economics.

The recent literature of accounting includes little on descriptive theories of accounting measurement. Voluminous descriptive materials on accounting measurement are available—in textbooks and publications of accounting standards-setting bodies, for example—but they do not offer coherent theories. On the other hand, theories of accounting measurement abound, but they tend to have a strong normative flavor. To my knowledge, no one has woven accounting measurement practices into a coherent, comprehensive theory.[1] This paper is designed to move in that direction.

If a scientist in a field far removed from accounting asked an accountant to tell him the central ideas of accounting measurement practices, what could the accountant say? Could he say that historical cost is the basis of accounting measurement? Surely he could not feel that he has conveyed the essence of the subject by reference to a principle that

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[1] Students of accounting theory are familiar with the work of several writers who have applied inductive reasoning in attempts to formulate generalizations that describe accounting practices, including Goldberg [1965], Ijiri [1975, 1967], Sterling [1966 and elsewhere], and Skinner [1972]. Writers in previous generations, such as Paton and Littleton [1940], Littleton [1953], Gilman [1939], and Hatfield [1927], also sought induced descriptions to some extent. None of these writers, however, induced a theory of accounting measurement from systematic observations of measurement practices.

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applies to a minority of balance sheet items. Could he hang accounting measurement on matching costs and revenues as the central pillar? As much as that idea says about the *timing* of expense recognition, the scientist would have great difficulty if he tried to use it in determining the *amounts* of costs, revenues, gains, losses, assets, and liabilities. Is conservatism the "most pervasive principle of accounting valuation"? [Sterling, 1967, p. 110]. Perhaps so, but it can hardly be identified as the centerpost for the entire structure of accounting measurement. To what document might the accountant refer the enquiring scientist? To the Financial Accounting Standards Board's *Accounting Standards* volumes? The entire set? If not, what part? To *Accounting Principles Board Statement No. 4* [1970] or Grady's *Inventory* [1965]? Surely no coherent theory could be gleaned from those documents without careful induction.

Of course, one must recognize the possibility of diverse views regarding the content of a coherent descriptive theory of accounting measurement. The view underlying this paper is that such a theory should:

1. Include an unambiguous statement of the subject matter of accounting measurement—of what is being measured. APB Statement No. 4, for example, states (p. 45): "The subject matter of financial accounting is economic activity and financial accounting therefore involves measuring and reporting on the creation, accumulation, and use of economic resources." That statement is exemplary in its conciseness, but does it hit the mark? In any event, the document does not build on that starting point in a logical manner. Part I of this paper is essentially a review of accounting practices that is aimed at discovering what accounting does measure.
2. Summarize the measurement methods that are used in accounting and the qualities of those measurements. In Part II, a broad sample consisting of 31 prominent categories of assets and liabilities is examined in an attempt to discover the measurement methods that are used, those that could be used but are not, and the qualities possessed by the accepted and rejected methods and the measurements they yield.
3. Focus on a central idea that serves as a basis for nearly all accounting measurement practices, or that describes the totality of accounting measurement. Modifying ideas that temper applications of the central idea might also be included. Part III develops such a central idea and relates the qualities of accounting measurements discovered in Part II to the central idea.

The authoritative literature of accounting has remarkably little to say on the above points, and none of that literature combines them in a coherent theory. The gap is wide.

A few comments regarding matters of methodology and style may help to set the stage. The reviews of practice included in Parts I and II cover much familiar ground. Experienced accountants may find it overly detailed and obvious; they may choose to skim those pages lightly. However, the evidence produced in those detailed reviews is the basis for the inductions that follow, so they are prerequisites to the conclusions. The underlying evidence examined in this research consists of accounting practices. Information about those practices comes from sources such as *Accounting Trends and Techniques* [AICPA, annually], accounting standards, annual reports, textbooks, and personal experience. Specific references are cited sparingly; the general authority for the practices reported here is generally accepted accounting principles.

The method for this descriptive research is empirical and inductive. The raw material consists of (direct and indirect) observations of measurement practices employed in accounting. Generalizations are produced by inductive reasoning. Because of the paucity of literature codifying and summarizing accounting measurement practices, my own interpretations play a large role in the association of specific measurement practices with a few general measurement methods, as well as in the comparison of measurement methods on the basis of the extent to which they possess certain qualities. There can be little doubt but that others would make different interpretations here and there. A substantial number of differences that tend to form a pattern could, of course, lead to different conclusions. I would be surprised, however, if many readers reached distinctly different conclusions.

Finally, I have found it convenient to personify accounting as capable of doing or saying this or that, sometimes as an alternative to referring to "the accountant" as doing this or that. The intent is to attribute choices of GAAP to accountants collectively.

The Scope of Accounting Information

A good starting point for a study of accounting measurement is a simple statement describing accounting in a general way. The development of such a statement could be approached as a major research project, but that may not be necessary to accomplish the present objective. The following brief definition may be acceptable to many as a basis for an investigation of the scope of accounting. *Accounting is a set of activities, focused on an economic entity, and concerned with information regarding the economic effects of events on the entity.*

Accounting Activities

The "set of activities" included in accounting may be expressed accurately in more or less detail according to one's purpose. The entire range of activities engaged in by those viewed as accountants is much too broad to indicate the scope of accounting activities according to common usage. Thus, when accountants participate in the management of risk (insurance), personnel, purchasing, cash, credit, and inventories, in the direct planning of "line" activities, and in making decisions regarding investments, they are not accounting. When they provide financial information for making such decisions, they are accounting. A listing of accounting activities sufficient to provide a basis for the explication needed here includes: discovering, identifying, or recognizing; classifying, measuring, recording, summarizing, analyzing, interpreting, and reporting. The subject matter of all these activities is the effects of economic events on the entity.

The Entity Focus

The focusing of accounting activities on one "entity" is occasionally suggested as the key difference between accounting and other activities dealing with economic information, such as economic analysis, and that usage appears to be generally accepted. Beyond that, little need be said about the entity concept in the present context.

Whenever the question is raised as to what point of view is taken in accounting (e.g., the proprietary, "entity," or residual equity viewpoint) the definition of the entity is likely to be questioned, but these matters are well settled in practice. The "accounting entity" is generally viewed as an economic unit under one management, so the scope of the management's power determines, in a general way, the boundaries of the entity.

Economic Effects of Events

The "events" and "economic effects" mentioned in the above definition of accounting are closely related. Millions of events occur every day, so accounting faces the task of screening out those to be ignored. Little is contributed by adding the adjective "economic" to events, not only because the economic character of accountable events is obvious, but also because any distinction between economic events and others is impractical, being a matter of degree. Some events, e.g., securities transactions, may generally be viewed as having a more distinctly economic character than others, e.g., a kiss, but who would dare to say that a kiss has no economic motivation or consequences? Surely most events have some economic effect on someone. The accounting screen is designed to separate those events having an economic effect on the entity from the total set of events. Thus, the economic effects of events on the entity is the subject matter of accounting.

Just as events span a wide range on the scale of how distinctly economic they are, so do the impacts of various economic effects on the entity differ widely. Different events, involving the same amount of money, may have great or small impact on the entity and that difference cannot be ignored by the accountant. The economic effects of some events, e.g., the issuance of securities by a corporation, are recognized by accountants; the economic effects of other events, e.g., the issuance of securities by competitors, are ignored; and the effects of still other events, e.g., making certain executory contracts, are recognized only enough to report them in notes. Why?

Selection of Events to Recognize

The criteria on which accountants decide to account for, or ignore, events are not stated clearly in the authoritative literature of accounting.[2] Occasionally accountants are heard expressing preferences for "transaction-based" financial reporting, but those are normative statements, unless "transaction" is being given such a broad meaning as to make it virtually synonymous with event. Provisions for uncollectibles, depreciation, and various write-downs and write-ups are too common to permit acceptance of the statement that accountants limit their attention to transactions of the entity. Nor does an examination of accounting textbooks and the other descriptive literature of accounting reveal any other widely accepted "recognition criteria."

Perhaps an informal review of a wide range of events can yield a clue regarding recognition criteria. Certain types of events *usually are recognized* in an entity's double-entry accounting system:

1. Cash/other goods (commodities, services, money claims, etc.) exchanges between the entity and another entity.

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[2] In a recent exposure draft, "Recognition and Measurement in Financial Statements of Business Enterprises" [FASB, 1983b], the FASB proposes four broad criteria for recognizing specific elements of financial statements. The general impact of adoption of those criteria would be to add to the definitions of each element a clause to the effect that to be recognized, the element must have a relevant attribute that is measurable with acceptable reliability. Many definitions in the literature include such a clause.

2. Receipt or delivery of goods from or to another entity in accordance with a contract, i.e., partial or complete performance of a goods contract, including continuous performance, e.g., property rentals.
3. Synthesis of resources, as in manufacturing a product.

Other types of events *sometimes are recognized* in accounting entries:

1. Changes in the economic significance of rights or obligations due to the passage of time.
    - (a) Recognized: depreciation, amortization, accrual of implicit interest (discount) in many cases, and changes from long-term to current classification.
    - (b) Not recognized: accrual of implicit interest (discount) in certain cases.
2. Physical changes in tangible property over time.
    - (a) Recognized: depreciation and spoilage.
    - (b) Not recognized: growth of timber and livestock.
3. Technological developments affecting the entity.
    - (a) Recognized: Some of those impairing the value of plant or inventories.
    - (b) Not recognized: Other cases of value impairment and technological advances through the entity's research and development activities.
4. Making wholly executory contracts.
    - (a) Recognized: Capital leases.
    - (b) Not recognized: Operating leases, employment contracts, etc.
5. Transactions between two other entities involving commodities or securities of interest to the entity.
    - (a) Recognized: The effects of price decreases reflected in commodity and security transactions when the entity holds similar items classified as current assets.
    - (b) Not recognized: Increases in prices of current assets and most changes in prices of noncurrent assets and the entity's outstanding debt.

Other events are *rarely recognized* in accounting entities:

1. Transactions between two other entities involving goods of a type not stocked by the entity. An exception is transactions reflecting lower prices of a commodity of a type for which the entity has made a purchase commitment.
2. Nontransaction, unpriced events directly involving other entities but not the accountant's entity.
3. The services of equity capital.

Many events are recognized by accountants but are *reported in supplementary materials* accompanying the primary financial statements as parts of financial reports, rather than being recognized by entries in the double-entry accounting system and reported in the primary financial statements. Examples are:

1. Making partly and wholly executory contracts that entail commitments to pay material sums of money in exchange for commodities or services.
2. Granting options to purchase the entity's securities.
3. Transactions of other entities establishing prices for certain securities or commodities of interest to the entity.

Significant generalizations based on the above observations are not readily formed, which means that principles for recognizing events in accounts—the first step in accounting measurement—are hard to find. However, if one augments the above review with a brief look at charts of accounts, "books," and financial statements of diverse entities, one finds that nearly all entries in the double-entry system have two common properties: they record changes in components of entity wealth,[3] and they record those changes in numbers. A third observation is that certain quantifiable changes in entity wealth items are not recorded as they occur. Thus, changes in wealth and quantifiability are necessary, but not sufficient, conditions for formally recording economic events. *Entries in double-entry systems record selected measurable changes in wealth items.*

Selection of Effects to Recognize

A simple type of accounting for the economic effects of events on an entity could be limited to measuring and reporting changes in entity wealth with neither omissions nor elaborations. Classes of wealth items and of events, causes of changes, and other circumstantial data could be ignored. All measurable changes in wealth could be included. In practice, however, accounting is neither so limited nor so inclusive. The omission of certain changes in amounts of wealth items will be dealt with, at least implicitly, later. The elaborative information reported by accounting is addressed here.

Accounting reports are not limited to a single number representing the amount of the entity's wealth. Much elaborative material typically is presented. An investigation into the scope of accounting information must not ignore that elaborative material. An important feature of accounting is the breakdown of entity wealth into classes. Accountants call the positive class assets and the negative class liabilities. The difference is described as owners' equity. The double-entry system is based on the residual claim of the owners; the balance of net assets is claimed by owners, so the net wealth items and owners' claims constitute an equation. Maintenance of the integrity of that equation requires that changes be made in at least two components at the same time. Double-entry does not, however, require accounts beyond balance sheet accounts. Nevertheless, we observe that accountants use temporary subdivisions of an owners' equity account to accumulate classified data on changes in owners' equity, and they report those classified changes in an "income statement." Other changes in owners' equity are also reported fully. Furthermore, classified changes in certain categories of wealth items are also reported, either generally or in certain cases, the most common category being one related to liquidity, viz., either cash or working capital. This is evidence of an interest in reporting on more than the amounts and changes in amounts of wealth items.

A review of the classification practices employed in financial statements might yield additional insights into the accountants' choices of which effects of economic events to report. Distinctions between short-term and long-term items, between monetary and nonmonetary items, the careful separation of positive and negative wealth items, the distinction between changes (in both owners' equity and cash or working capital) that tend to recur and those that do not, the disclosure of those operating costs that are determined by allocating long-term assets among periods, the disclosure of gross revenues and of various object classes of expenses—all of these provide indications of what accounting intends to report.

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[3] A class of exceptions was noted by an anonymous reviewer: transactions with owners recorded entirely within the owners' equity section, such as stock dividends and conversion of preferred shares into common.

Finally, those parts of financial reports other than the financial statements that report account balances might be reviewed for evidence of the types of economic effects that accounting reports. Those parts include the statement of changes in financial position and various supplementary disclosures regarding contingencies; commitments made in executory contracts; tax, pension, and stock option information; quarterly, segment, and changing prices schedules; debt maturities; and many other subjects.

The Scope of Accounting Information: Findings

The above review of the contents of financial reports leads to the following generalizations. The economic effects of events that are given the greatest emphasis in accounting practice are:

1. Measurable changes in specific components of entity *wealth* and in the owners' interest in the sum of entity wealth components. Evidence: the accounts included in the double-entry system.
2. Measurable and unmeasurable changes in the entity's *liquidity*. Evidence: the current/noncurrent and monetary/nonmonetary distinctions on the balance sheet; the statement of changes in financial position (focusing on cash or another category of net liquid assets); debt maturity schedules.
3. Effects on *risks* to which the entity and its constituents are exposed. Evidence: all of the information on liquidity, since the primary risk of concern to constituents is the risk of loss of liquidity; separation of items that tend to be nonrecurring and items that tend to recur and, to some extent, separation of costs that tend to be fixed and those that tend to vary directly with volume of revenue; notes on contingencies, commitments, etc.

Other economic effects of events are also included in financial reports, but they are not emphasized as much as the above three. Information on the distribution of "value added" among constituents—owners, creditors, employees, and government—may be given some attention in the United States, although much less than in the European Economic Community. Finally, a rather vague category, which might best be described as information to help readers understand the economics of the business, is also included in some financial reports, especially in "management's discussion and analysis."

In sum, the scope of accounting information is broad but clearly constrained. It includes quantified and unquantified information regarding entity wealth, information on entity liquidity and risk, information related to the distribution of value added among constituents, and a wide variety of information pertaining to the economics of the business. The focus is unquestionably on stocks and flows of entity wealth items, but the ways that accounting deals with the measurement of wealth items might well be affected by the inclusion of the other types of information. However, those other types of information—on liquidity, risk, distribution of value added, and economics of the business—may be viewed as elaborative information pertaining to entity wealth. For example, liquidity relates to the convertibility of a wealth item into a cash flow; risk includes variance in the distribution of cash flows from one, or a combination of, wealth items. *The heart of accounting is the measurement of aspects of wealth.*

MEASUREMENT OF THE EFFECTS OF ECONOMIC EVENTS ON ENTITY WEALTH

Accounting focuses on amounts of wealth items, including changes in those items. However, the review of the events recognized in the double-entry system showed that certain measurable changes in wealth are omitted from that system. Why? Does interest in reporting on liquidity, risk, and other matters affect the accountant's choice of which measurable changes in wealth items to report? Or are other factors involved? How do accountants measure wealth items? The objective of this section is to gain an understanding of accounting measurement practices. The first step is to make detailed observations of measurement practices. Then, generalizations in the forms of summaries and inferences will be attempted.

Observations of Measurement Practices

The review of the scope of accounting showed that accountants measure wealth items, i.e., assets and liabilities. The task at hand now is to discover how accountants measure wealth items and changes therein. This section focuses on measurement methods. The typical accountant is more likely to speak of alternative valuation bases than measurement methods. The latter term is used here to include both the particular valuation base that is the key feature of a measurement and the more specific procedures involved in applying that basis of valuation. For example, when the accountant speaks of accounting for machinery "on the historical cost basis of valuation," only the key feature of the measurement process is specified. The treatment of various "fringe acquisition costs," such as transportation, installation, and interest, as well as the question of how to assign the acquisition cost to periods and operations, is not specified in the term "historical cost basis of valuation." Here the term measurement method is used to include the specific procedures applied in measuring as well as the base value which the specific procedures modify.

Measurement Methods

A representative selection of accounting's choices of measurement methods is presented in Exhibit 1. Those 31 cases are chosen on the basis of their prominence in textbooks and the attention they have received by standards-setting bodies. Most of the cases covered in the typical intermediate accounting course are included. The asset and liability items listed include items common in manufacturing, distribution, and service industries, as well as several found primarily in banks, securities firms, and extractive industries. Circumstances that accountants consider in choosing a measurement method are indicated, but the finer points of such circumstances are omitted in the interest of brevity. For example, the choice between the cost and equity methods for equity securities owned is based on circumstances affecting the investor's ability to exercise significant influence over the investee, not strictly on the 20-percent test.

The selection of "reasonably available" measurement methods is, as the term implies, a matter of judgment. Any method that actually is used is judged reasonably available, as are those methods which are used in other circumstances in which their application appears to be at least as difficult as in the

EXHIBIT 1

CHOICES OF ACCOUNTING MEASUREMENT METHODS IN U.S. GAAP*

Net Asset Item and Circumstances	*Measurement Methods Reasonably Available*	*Qualities on Which a Method is Superior*	*Notes*
Receivables:			
1. Trade Accounts	FCF, net (GAAP)		Discount may be immaterial
	PVFCF, current rate		
	FCF, gross	R, E, U	Direct write-off of losses
	OAC	Cn	Based on cost of goods sold
2. Notes, short-term trade, with accrued interest	PVFCF, net, old rate (GAAP)		
	PVFCF, current rate	Cp	
	FCF, gross	R, E	
	OAC	Cn	Interest not accrued
3. Long-term, miscellaneous	PVFCF, old rate (GAAP)	S	
	PVFCF, current rate	Cp	
	FCF, gross	R, E	
	OAC	E, Cn, U	
4. Banks' loans, with accrued interest	PVFCF, net, old rate (GAAP)	FC	
	PVFCF, current rate	CP	
	FCF, gross		
	OAC	R, E, Cn, U	
Newly restructured bank loans, modifications of terms:			
5. FCF > old PVFCF	PVFCF, old contract (GAAP)	E, S	
	PVFCF, new contract	Cn, Cp	
	FCF, gross	R, FC	
6. FCF < old PVFCF	FCF, gross (GAAP)	R, FC	
	PVFCF, new contract	Cn, Cp	
	PVFCF, old contract	E, S	
Debt securities owned:			
7. Current portfolio, market > cost	PVFCF, old rate (GAAP)	Cn, FC, S	Same as amortized OAC
	CMP	E, Cp, U	Same as PVFCF, current rate
	OAC	E, Cn, FC, S, U	No amortization
8. Current portfolio, market < cost	CMP (GAAP)	E, Cn, Cp	Practice is not uniform
	PVFCF, old rate	FC, S	
	OAC	E, FC, S	
9. Long-term or unclassified portfolio	PVFCF, old rate (GAAP)	FC, S	
	CMP	E, Cp, U	
	OAC	E, FC, S, U	
	Lower of PVFCF and CMP	Cn	
10. Securities firm's portfolio	CMP (GAAP)	E, Cp, U	Case includes investment company portfolios and trading portfolios
	OAC	E, FC, S, U	
	PVFCF, old rate	FC, S	
	Lower of PVFCF and CMP	Cn	

EXHIBIT 1 *(Continued)*

Net Asset Item and Circumstances	*Measurement Methods Reasonably Available*	*Qualities on Which a Method is Superior*	*Notes*
Equity securities owned:			Marketable shares only
11. Less than 20%, CMP > OAC	OAC (GAAP)	Cn, FC, S, U	OAC typically more conservative than EM. Both OAC and EM permit choice of date to realize gain or loss
	CMP	Cp, U	
	EM	FC	
12. Less than 20%, current portfolio, CMP < OAC	CMP (GAAP)	Cn, Cp, U	A mixed method applies to shares in noncurrent portfolio
	OAC	FC, S, U	
	EM	FC	
13. 20–50%	EM (GAAP)	FC	
	CMP	Cp, U	
	OAC	FC, S, U	
14. Greater than 50%	Consolidation (GAAP)	FC	
	CMP	Cp, U	
	OAC	FC, S, U	
15. Securities firm's portfolio	CMP (GAAP)	Cp, U	
	OAC	FC, S, U	
	EM	FC	
Inventories:			
16. General case, "market" > OAC	OAC (GAAP)	R, E, Cn, FC, S	
	NRV (probable course)	Cp	NRV not always available; also must reflect likely channel of disposition
	CAC	Cp	
17. General case, "market" < OAC	CAC/NRV (GAAP)	Cn	NRV not always available; also must reflect likely channel of disposition
	NRV (probable course)	Cp	
	OAC	R, E, FC, S	
18. Joint products, majority case	OAC, allocated (GAAP)		
	NRV	Cp, U	
	CAC, allocated		
19. Joint products, minority case	NRV (GAAP)	Cp, U	
	OAC, allocated	FC, S	
	CAC, allocated		
Property, plant and equipment:			
20. General case	OAC, net (GAAP)	Cn, FC, S	
	OAC, gross	R, E, U	
	CAC, gross		
	CAC, net	Cp	
21. In discontinued segment	NRV (GAAP)	Cn, FC	
	OAC, net	R, E	Other methods could be listed
22. Natural resource reserves	OAC, net, full cost (GAAP)	S	Popular among small companies
	OAC, net, Suc. efforts (GAAP)	Cn, FC	Popular among large companies
	PVFCF	Cp	

EXHIBIT 1 *(Continued)*

Net Asset Item and Circumstances	*Measurement Methods Reasonably Available*	*Qualities on Which a Method is Superior*	*Notes*
Intangibles, other:			
23. Identifiable intangibles	OAC, net (GAAP)	S	
	OAC, gross		
	Immediate expense	R, E, Cn	
24. Goodwill, purchased	OAC, net (GAAP)	S	
	OAC, gross		
	Immediate expense	R, E, Cn	
25. R and D benefits	Immediate expense (GAAP)	R, E, Cn	
	OAC, gross or net	S	
26. Tax allocation asset	OAC (GAAP)	S	Deferral method
	PVFCF, current rate	Cp	
	FCF		Liability method
	Flow through	R, E, Cn, U	
Liabilities:			
27. Tax allocation liability	OP (GAAP)	Cn, S	Deferral method
	PVFCF, current rate		
	FCF	Cn	Liability method
	Flow through	R, E, U	
28. Short-term payables	FCF (GAAP)	R, E, Cn, U	
	PVFCF	Cp	Discount may be immaterial
29. Borrowings, not publicly traded	PVFCF, old rate (GAAP)	FC, S	Amortized original proceeds
	PVFCF, current rate	Cp	
	OP	R, E, FC, U	
30. Borrowings publicly traded	PVFCF, old rate (GAAP)	FC, S	
	CMP	Cp	
	OP	R, E, FC, U	
31. Nonmonetary liabilities	OP (GAAP)	R, E, S, U	Revaluation is not common
	NRV	Cp	Negative value
	Current proceeds		

* The explanations in the text subsections on measurement methods and qualities of accounting measurements are integral parts of this Exhibit.

case in question. For example, the original acquisition cost method is available for application to trade accounts receivable. The methods listed are limited to those found in practice, although current cost is extended to include proceeds for liabilities, and net realizable value includes the negative version for liabilities.

The practical literature on measurement methods is so fragmented that taking inventory of the methods in use is a challenge. Furthermore, the terminology of measurement methods is not well developed; some choices must be made to permit a condensed presentation. My search and terminology choices turned up eight basic measurement methods (plus variations) in current use. Their specifications, as the terms are applied in Exhibit 1, are as follows:

1. Current market price (CMP) applies only to those cases in which the entity buys and sells the item in the same market, e.g., an organized securities or commodity market. No fringe acquisition costs are added and no costs of disposition are deducted.
2. Future cash flows (FCF) are based on contractual evidence of the amounts to be transferred, without discounting for waiting. FCF could be net of estimated uncollectibles or gross—the amount specified in the agreement (oral or written). In the latter case, any losses due to a debtor's failure to pay are recorded on a direct write-off basis.
3. Present value of future cash flows (PVFCF) is based on contractual evidence of the amounts and times of future cash flows, less a discount for waiting. The discount rate is selected by more or less direct observation of market interest rates, so it usually includes a premium to cover uncollectibles. If an additional provision is made for uncollectibles (PVFCF, net), it is interpreted as a conservative form of double counting. The discount rate employed may be the rate observed at the date of origin of the claim or obligation (old rate) or it may be revised to the measurement date (current rate). PVFCF at the current rate is the same as current market price in the case of actively traded debt securities. In the case of restructured loans, the practice of ignoring modifications of terms is described as PVFCF, old contract, while a revision to recognize the revised terms is described as PVFCF, new contract. PVFCF differs from CMP in that the former entails observation of evidence of times and amounts of future cash flows and of a market discount rate. Those data are then processed by the accountant to obtain the result. When the accountant uses CMP he accepts the market's observations and processing of evidence.
4. Net realizable value (NRV) is the current price in the market in which the entity either expects to sell the asset or would sell it if required to do so to raise funds quickly, net of costs of disposition. Accounting practices regarding NRV vary. In some cases sale of the asset—for example, work in process or construction in progress—in its current condition (as-is) is assumed; in other cases sale in the ordinary course of business (completed cycle) is assumed. Furthermore, it is difficult to determine the accountants' limit with respect to the clarity of the evidence accepted. For example, determination of the NRV of business segments being discontinued or of manufacturing work in process may strain the accountant's reliability standard. Here the meaning of "reasonably available" is at its haziest. The application of negative NRV to an obligation to deliver goods or provide services is another unclear area.
5. "Original acquisition cost" (OAC) is used instead of "historical cost" because essentially all measurements in accounting are based on history. Accountants include fringe acquisition costs if they are material, including interest cost in accordance with the FASB's Statement No. 34. Measurement of

notes receivable at OAC means interest is not accrued. OAC net means depreciation, depletion, or amortization is deducted. In the oil and gas industry, OAC may be determined on a full cost or successful efforts basis.

6. Current acquisition cost (CAC) is determined in the same manner as OAC except that current input prices are substituted for input prices at the original acquisition date. Current proceeds is the term adopted here for a symmetrical application to liabilities, i.e., the price the market offers now in exchange for similar promises.
7. Original proceeds (OP) is the amount of money received in exchange for the obligation in question at the date it was established.
8. The equity method (EM) of accounting for equity securities owned starts with OAC and adjusts for the investor's share of changes in the investee's owners' equity and for amortization of acquisition-date discrepancies between OAC and the book value of the equity interest acquired.

In addition to the above methods of measuring net asset items, the alternative of no measurement is listed in several cases where that has been recognized as a reasonable possibility. No measurement is called flow through in the cases of tax allocation items and immediate expense in the cases involving intangibles.

For each asset or liability item, two or more measurement methods are listed as reasonably available. The one required by U.S. GAAP is so labelled.

Qualities of Accounting Measurements

Alternative methods for measuring wealth items typically are available to accounting, although not to individual accountants.[4] Those alternative measurement methods vary in the degree to which they and the corresponding measurements possess various qualities. The major qualities that my observations show to be valued by accounting are:

1. Reliability (R), including verifiability, neutrality, and representational faithfulness, with respect to what the method purports to measure as described in SFAC No. 2 [FASB, 1980a].
2. Economy (E), or low cost of application.
3. Conservatism (Cn). (In assessing conservatism of methods, selling prices of goods are assumed to exceed cost.)
4. Flexibility and control of income measurement by management (FC), either currently or in the future. Measurement techniques that possess the flexibility/control quality are those that entail judgments, such as providing for uncollectibles or estimating net realizable value of a discontinued segment; those that permit some flexibility in timing, such as the timing of abandonment of a "dry hole" or of the decision to discontinue a segment or to restructure a debt; and methods that keep income determination options open, such as the reservoirs of instant earnings and/or instant losses made available by OAC measurements. The essence of this quality is choice, not variability over time.
5. Stability (S), or offering (if desired) a stabilizing influence on the series of income statement numbers

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[4] The choices available to the individual accountant tend to be variations of one of the eight measurement methods listed above.

associated with the net asset over its life. This quality characterizes several asset measurement techniques such as OAC in general (compared with CMP, CAC, or NRV), time-based calculations of depreciation and amortization, adhering to old discount rates or to old PV's of restructured loans, and full costing in extractive industries. Many recent popular statements of preference for this quality have included pejorative references to "yo-yo accounting."

6. Comparability (Cp), across entities and across like items within an entity. Any method that gives different measurements of things with similar economic significance as wealth items lacks comparability. Generally, abandoning varying old costs and discount rates in favor of uniform current prices contributes to comparability of measurements of similar items.
7. Understandability (U), from the point of view of both the accountant and the reader of financial reports.

These seven qualities are presented at this stage as a tentative list of qualities prized by accounting. Analysis of the 31 measurement cases in Exhibit 1 may eliminate one or more of the seven. Relevance is not listed because (1) it was not in the vocabulary of practical accounting until introduced by normative theorists, (2) clear observation of its presence or absence is difficult, and (3) it is easily confused with the more fundamental idea of measuring wealth items. Consistency is omitted because it is not a quality associated with any one measurement method.

The measurement methods listed for each net asset item were compared on each of the above seven qualities. When one (occasionally two) method(s) was judged to be substantially superior to the others on that quality, the symbol identifying that quality was entered in column three. When the quality was judged of minor importance in the circumstances of the case, it was not listed for any measurement method. Explanatory notes appear in column four.

Measurement Practices: Summaries

The detailed contents of Exhibit 1 are analyzed and summarized in Exhibits 2, 3, and 4. Exhibit 2 shows the frequency with which each of the eight methods of measuring net asset items is called for by GAAP in the 31 cases examined. In one case examined, no net asset item is recognized in the accounts, i.e., research and development costs are expensed as they are incurred, even though the overall results of a company's R and D efforts typically meet the tests of an asset as defined in SFAC No. 3 [FASB, 1980b]. The most important message in Exhibit 2 is that no one measurement method dominates accounting practice. Rather, accounting's measurement practices range across eight general methods.

Exhibit 3 summarizes the qualities characterizing GAAP measurement practices in the 31 cases examined. Column two tallies the number of cases in which the GAAP method is superior (or tied for superiority) to all other methods deemed reasonably available on the quality listed in column one. GAAP practices were found to be characterized by stability and conservatism more frequently than by the other qualities. In three cases the GAAP method was found to possess none of the seven qualities, thus raising a question regarding overlooked qualities.

The "trade-off matrix" in Exhibit 4 shows which quality(ies) was gained

EXHIBIT 2

MEASUREMENT METHODS IDENTIFIED IN EXHIBIT 1 AS THE GAAP METHOD

Method	*Number of Cases*
Future cash flows	3
Present value of future cash flows	8
Current market price	4
Net realizable value	3
Current acquisition cost or current proceeds	1
Original acquisition cost	8
Original proceeds	2
Equity method or consolidation	2
Immediate expense	1
Total	32*

* There are 32 solutions to 31 cases because case 17 has two GAAP solutions.

EXHIBIT 3

NUMBER OF CASES IN WHICH THE GAAP METHOD IS SUPERIOR TO ALL OTHER METHODS ON SPECIFIED QUALITIES

Quality	*Number of Cases*
Reliability	5
Economy	5
Conservatism	10
Flexibility/Control	6
Stability	13
Comparability	5
Understandability	3
No superior quality	3

when the GAAP method was selected and which quality(ies) possessed by a nonGAAP method was sacrificed in choosing the GAAP method. To be listed here, a sacrificed quality had to be associated with a nonGAAP method and not associated with the GAAP method. A gained quality had to be associated with GAAP and not associated with any other available method. The cells with large numbers, such as the intersection of the comparability row and the stability column, show the more common consequences of the measurement method choices accounting has made. Large column totals draw attention to qualities frequently gained by the choices that have been made. Large row totals indicate qualities frequently sacrificed. Comparisons of numbers in the $(S; Q_n)$ cells with those in the (Q_n, S) cells show that stability dominates every other quality and that conservatism and flexibility and control are also popular.

Measurement Practices in Accounting: Generalizations

The observations, analyses and summaries of measurement practices found in U.S. GAAP justify the following generalizations:

EXHIBIT 4

TRADE-OFFS INVOLVED IN 31 GAAP MEASUREMENT CHOICES

When This Quality is Sacrificed	*Times Sacrificed*	*This Quality is Gained*							
		R	*E*	*Cn*	*F/C*	*S*	*Cp*	*U*	*None*
Reliability	18	0	1	3	3	9	0	0	2
Economy	18	1	0	3	4	8	0	0	2
Conservatism	13	1	1	0	2	6	1	1	2
Flexibility/Control	12	0	1	3	0	2	5	3	0
Stability	16	2	1	5	2	0	5	2	0
Comparability	33	4	4	6	5	10	0	3	2
Understandability	11	0	0	1	2	6	0	0	2
Total sacrifices/gains	121	8	8	21	18	41	11	9	10

1. Eight general methods for measuring wealth items are used in accounting. No one method is dominant.
2. Stability of the related income statement line item, conservatism, and flexibility and control of income measurement by management are qualities frequently associated with the measurement methods chosen by accounting. Economy, understandability, reliability, and comparability appear less frequently.
3. The trade-offs made in choosing accounting measurement methods frequently have involved giving up methods that are superior on comparability, reliability, and economy and accepting methods superior on stability, conservatism, and flexibility and control.

A THEORY OF ACCOUNTING MEASUREMENT

The review displayed in Exhibit 1 discovered eight different methods (plus variations) of measuring entity wealth items. That review also showed that several qualities of measurements and measurement methods frequently characterize the application of those methods. A multiple-method, multiple-criteria picture of accounting measurement practices emerges. In view of these findings, is any central pillar of accounting measurement evident? Is there a single, coherent thread that ties accounting measurement practices together? What key idea can be presented (to students, practitioners, and others seeking an understanding of accounting measurement) that can contribute to that understanding? No answers are obvious.

Market Prices as Raw Material

Homogeneity of accounting subject matter has been found: wealth. Homogeneity of method is elusive. What does the accountant look for after he has recognized a wealth item? One feature of the accountant's method is obvious: quantification. The assignment of numbers to represent the significance of wealth items requires a source of numbers. In a markets-driven economy, that source is nearly always a market, rather than a government office or a manager's imagination. Most of the numbers accountants assign to wealth items are observed market prices or derivatives thereof.

The characteristics of the markets in which the raw material for the accountant's measurements are formed vary. We live in a world of incomplete markets, so prices for many net asset items are unobservable; no trading in the particular items owned or owed by the entity takes place. In other cases, markets are "thin," i.e., trading occurs infrequently. In still others, prices may be heavily influenced by one buyer or seller, thus casting doubt on those prices as predictions of future cash flows. Transaction costs and imperfect information add to the difficulties facing measurers of wealth items. In sum, incomplete and imperfect markets present many obstacles to one who would use market prices in measuring wealth items, so accounting seeks ways of overcoming those obstacles.

The dearth of market quotations mentioned above does not eliminate the necessity of choosing from among alternative prices. For example, prices of assets at their acquisition dates commonly are reported, but prices at the reporting date sometimes are substituted. Inventory cost flow assumptions involve alternative interpretations of acquisition dates. Another choice is that between entry prices and exit prices; accounting has chosen the former in most cases.

Prices established in market transactions are used in most accounting measurements, although the role of market prices in three of the common measurement methods is less obvious than it is in the other four. The equity method starts with an original acquisition price and is adjusted by changes in retained earnings, which are based largely on market prices used in measuring the investee's net asset items. Measurements based on future cash flows and present values of future cash flows often reflect market prices of nonmonetary items involved in the exchanges, and present value computations employ market prices for the use of money. The roles of market prices in the other measurement methods are obvious. Accounting measurements clearly are based largely on market prices.

Processing Procedures

Those who view accounting measurement as the selection and processing of evidence relating to the amounts of wealth items might view market prices as the dominant type of inputs to that process. In addition to obtaining various market price data and selecting specific prices to use in his measurements, the accountant performs additional procedures, including:

1. Combining prices, e.g., in adding fringe acquisition costs to a nominal purchase price, in product cost accounting, in discounting future cash flows, and in computing net realizable value.
2. Estimating or predicting, e.g., uncollectibles, lives of assets, future inputs of resources to complete a product or fulfill a warranty obligation, employee turnover and mortality related to pensions, matrix pricing of unquoted portfolio securities, and even prediction of prices such as salvage values of depreciable assets and prices of future inputs required to fulfill warranty obligations.
3. Allocating, especially splitting one value into parts in proportion to some base, as in allocation of indirect costs in product costing, allocation of process costs among

joint products, and depreciation accounting.

4. Miscellaneous procedures such as indexing and tax allocation.

Experienced accountants can find many examples of similar processing procedures in the GAAP (and alternative) solutions to the 31 cases listed in Exhibit 1.

Why has accounting developed such a complex set of adaptations of primary market prices? The answer may follow from the interpretation of wealth items found in *Elements of Financial Statements of Business Enterprises* [FASB, 1980b, p. 9]. Assets are defined as probable future economic benefits obtained or controlled by a particular entity, not as physical commodities. Similarly, liabilities are defined as probable future sacrifices of economic benefits. Those definitions apply to assets and liabilities in general financial and economic usage, not to balance sheet categories. They include two subsets in each case: balance sheet assets (liabilities) and off-balance sheet assets (liabilities). I believe those definitions are close to the intuitive views of most economic actors, including accountants, except when they are making decisions regarding balance sheet content. Accounting measurement practices seem to be related to those views of assets and liabilities. The concepts of assets and liabilities may be described as *future-oriented* and *setting-specific*, because an item's significance derives from its *future* role in the *entity*—its contributions to future cash flows. No market prices for those setting-specific assets and liabilities are available. For example, prices established currently without the participation of the entity, even if the item being traded is essentially the same as an asset held by the entity, do not price the probable economic benefits the entity's asset will provide to the entity. Even a market price paid by the entity is not a market price for setting-specific benefits; it reflects the influence of two or more participants' views of benefits in a variety of settings. Market prices for the setting-specific benefits to be yielded by an entity's assets are not available. Accounting makes do with substitutes, including simple surrogates (i.e., a single price accepted as the value of a net asset item) and complex adaptations of observed prices. This combination can be called simulated market prices, because they are not observed prices of the setting-specific assets and liabilities that are of interest to those concerned with entity wealth.

Adaptations Per Principles of Market Economics

Another look at the measurement practices used in accounting can reveal the extent to which accounting relies on market simulation for its measurements. Exhibit 5 is a summary of such a review. Columns two and three show the generalizations that might be called principles of market economics that are related to the measurement practices—column two for those principles that are observed and column three for those ignored by accounting.

A few explanations may clarify certain of the rather cryptic statements in Exhibit 5:

1. Regarding FCF, while it is true that accounting fails to discount short-term trade receivables and payables, some may argue that lack of materiality, rather than disregard for market economics, is the explanation.
2. In the cases of entry price methods, one could say that accounting ignores the common belief that

EXHIBIT 5

MARKET SIMULATION ACCOUNTING: THE ASSOCIATION OF ACCOUNTING MEASUREMENT PRACTICES WITH PRINCIPLES OF MARKET ECONOMICS

	Principles of Market Economics: Generalizations Based on Observations	
Accounting Measurement Practices	*Observed in Accounting*	*Ignored in Accounting*
Future cash flows and PVFCF:		
Accrual accounting in general	Markets pay for prospective cash flows.	Markets discount for waiting. (Ignored in case of short-term trade items)
Deduct for uncollectibles	Markets recognize expected value.	
Discount when material, using risky, original rate	Markets discount for waiting and for risk.	Market discount rates fluctuate. (Old rates differ from current rates.)
Current market price	All.	None.
Matrix pricing of securities	Those specified in equation.	Omitted variables.
Net realizable value:		
Current exit price	Price series exhibit autocorrelation; current prices are predictors of future prices and cash flows.	
Deduct for future costs	Markets allow for both positive and negative components of expected value.	
Deferral accounting in general, including deferrals of cost and proceeds (e.g., capitalizing fringe acquisition costs, product cost accounting, deferring credits to revenue)	Firms tend to make productive uses of resources on hand; product prices (and future cash flows therefrom) are positively correlated with the sum of costs.	
Allocate common costs of joint products per relative net sales value	Price/cost correlation.	Markets pay for prospective cash flows, not for retrospective cash flows.
Depreciation, depletion and amortization accounting	Price/cost correlation. Markets tend to equalize the net unit costs of similar services available from alternative sources (so the market price of a bundle of services declines with the number and "quality" of units in the bundle.)	Markets discount for waiting; cost of capital is considered.
Original acquisition cost and original proceeds	Price series exhibit autocorrelation; old prices are related to current prices.	Autocorrelation in a price series is less than one. Markets pay for prospective cash flows.
Indexing to obtain current acquisition cost	Prices of goods constituting a homogeneous set (in use or production) are closely correlated (so a narrow index can be used to estimate a specific current price).	Price relationships vary over time.
Equity method for equity securities.	Book values and changes therein are correlated with market values and changes therein over long periods.	Markets pay for prospective cash flows.
Interperiod tax allocation per original proceeds or OAC	Markets value uncertain future cash flows.	Markets discount for waiting and for risk.

selling prices of entity products approximate future cash flows from those products more closely than the sums of entry prices of resources used in making the products approximate those flows. The interpretation here, however, is that in most applications of OAC and CAC, failure to use NRV does not indicate disregard for economic principles as much as it indicates the difficulties that would be involved in isolating portions of product selling prices attributable to a resource stock on hand. In other words, NRV is not practically available.

3. In the case of joint products, note that the failure of the relative sales value method of allocating costs to yield acceptable cost numbers does not indicate a departure from market simulation accounting. Taking the retrospective (input) view rather than the prospective (output) view is the departure from the market simulation notion.
4. When obligations to deliver goods are measured at original proceeds (the amount of money received when the obligation was created), that number might be interpreted as a surrogate for the sum of the costs of resources to be used in fulfilling the obligation, that is, a set of future costs. Both stability of price series over time and a strong tendency for costs to equal selling price are required if OP is to be a good predictor of future negative cash flows.
5. The effect of an asset's tax basis on the future cash flows it will yield is generally recognized. The deferral method of tax allocation says, in effect, that the tax saved or extra tax paid this period affects wealth by the same amount, without regard for delay in the reversal, changes in the tax rates, or the probability that reversal will never affect tax payments (or refunds). If assets were commonly traded with their tax bases carried over to the buyer, markets presumably would take all of those factors into account in pricing those assets, just as bond markets distinguish between taxable future cash flows and nontaxable flows.

The evidence shows that every measurement method used in accounting incorporates one or more principles of market economics. Indeed, only two major principles have been widely—but not uniformly—neglected: (1) the cost of capital requires discounting of future cash flows, and (2) current market prices are closer surrogates for complete and perfect current market prices of setting-specific assets and liabilities than are old market prices. The trend towards rectifying the first case of neglect is apparent in many relatively recent standards that require recognition of interest, such as APB Opinions 8, 12, and 21 and FASB Statements 13, 34, and 35. Regarding the second case of neglect, decades of flirtation with and nibbling at current measurements in lieu of original acquisition cost suggest that the mainstream of accounting thought and the market simulation view of accounting measurement are not irreconcilable on the old-vs.-current-prices issue. (Neither case was as serious when prices were more stable.) Those exceptions clearly are big ones with material impacts on the results of the accounting measurement process, but they do not present a huge conceptual gap. A general pattern of respect for principles of market economics suggests that accounting measurement practices tend to simulate complete and perfect market prices. The entire fabric of accounting measurement now appears to be more tightly woven—more coherent—than was previously believed.

The Common Thread: Market Simulation Accounting

The search for a common thread in accounting measurement practices shows that:

1. Accounting uses market prices as the primary raw material going into the measurement process.
2. In a world of incomplete and imperfect markets, complete and perfect market prices for the setting-specific assets and liabilities that are of concern to users of financial statements cannot be observed.
3. Accounting applies a set of adaptive procedures to a set of basic market prices to fabricate the measurement methods listed in Part II of this paper. Applications of those methods to case-specific circumstances yield the measurements of entity wealth items reported in financial statements.
4. The adaptive procedures employed in accounting generally reflect familiar principles of market economics, subject to two important exceptions.
5. The choices of market prices and adaptive procedures reflected in GAAP yield measurements that can be labelled simulated market price.

The main conclusion of this review of accounting measurement practices is:

> *In the absence of observable current market prices for setting-specific assets and liabilities, accounting simulates such prices by selecting and blending pertinent observed market prices and other evidence in accordance with accepted principles of market economics.*

Other Explanations

The market simulation notion does not fully explain accounting measurement practices. Accounting deliberately ignores two important principles of market economics in many cases, as was pointed out in the preceding subsection. Any comprehensive, descriptive theory of accounting measurement must explain those deliberate anomalies in the application of market simulation accounting. Part II of this paper developed such an explanation. Accounting has been found so frequently to choose measurement methods with certain qualities that an observer might conclude that accounting values, even prizes, those qualities. The extent to which market simulation accounting is achieved in current GAAP measurements is constrained by respect for those qualities. The evidence reported in Part II suggests that stability of the related income statement line item, conservatism, and flexibility and control of income measurement by management are the qualities most valued by accounting. The market simulation concept combined with respect for those, and other, qualities explains most of the body of current measurement practices in accounting.

Summary of Generalizations

All of the observations presented and discussed in this paper may be reduced to the following general statements:

1. Wealth is the fundamental subject matter of accounting measurement. Accounting identifies, measures, classifies, and reports stocks and flows of wealth so as to provide information on income, liquidity, risk, and other aspects of wealth.
2. Market prices of economic goods are the primary raw materials used

in the eight general accounting measurement methods.

3. Accounting's choices from among alternative market prices invest the body of generally accepted accounting measurement methods and the resulting measurements with certain qualities, especially stability of the related income statement line item, conservatism, and flexibility and control of income measurement by management.
4. Prices for the setting-specific, future-oriented entity assets and liabilities with which the financial community is concerned are not observable. In their absence, accounting simulates such prices by selecting and blending pertinent observed market prices and other evidence in accordance with accepted principles of market economics, subject to a respect for certain "qualities" of measurement methods and measurements, such as those mentioned in no. 3 above.

CONCLUSION

The market simulation theory of accounting measurement, like any theory, might be viewed as a hypothesis that should be subjected to further testing and development. For example, the present research provides only crude evidence of the relative weights of the various explanations of measurement method choices. One auxiliary hypothesis that might be tested is that the qualities most frequently possessed by accounting measurements carry great weight in the selection of the basis of valuation, a matter of much concern to managements and other nonaccountants, but that the implementation choices that tend to be left to accountants are heavily influenced by the market simulation notion. Or perhaps certain qualities influence the selection of the basis of valuation and other qualities tend to influence the finer points.

Any reader who is dissatisfied with my interpretative assessments of the degrees to which specific measurement methods possess specific qualities in specific cases may wish to pursue such assessments by means of questionnaires. If such research resulted in refinements of the weights of the several explanations, the way might be paved for the use of the theory in predicting standards to be set in areas now on the FASB's agenda. A first step in that direction might be a study of the inputs received by the FASB in the last ten years in an effort to discover motivations behind the preferences expressed by respondents and by speakers at public hearings. Motivations of participants in the decision-making process could serve as the basis for a theory of accounting choice. The present research studiously avoids attributing motivations to anyone.

The market simulation notion is not represented as an excellent explanation of all accounting measurement practices. Current practice represents very crude market simulation accounting. The more important point is that the market simulation explanation fits present accounting measurement practices better than any other single explanation—better than historical cost, better than matching costs and revenues, better than exit values or current cost. Furthermore, GAAP is the best expression of the market simulation concept that is found in current accounting practice. GAAP is better market simulation accounting than is the cash basis, the income tax basis, or any known regulatory basis of accounting such as Interstate Commerce Commission or insurance commissioner requirements. GAAP is the best description of market simulation accounting that can be found in practice.

Finally, one might consider the parallel between the market simulation accounting hypothesis and the efficient market hypothesis. The latter can hold despite poor use of information by many individual investors and despite their refusal to accept the hypothesis. Market efficiency, to the extent that it occurs, is a collective phenomenon, not an individual one. Similarly, the collective impact of the views of those who have influenced GAAP over many decades may be a substantial degree of market simulation accounting, even if most individual accountants do not recognize it. Adam Smith might detect evidence of an invisible hand controlling not only the allocation of resources in a competitive economy and the pricing of securities in major world markets, but also the evolution of accounting measurement practices in the private sector.

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Multinomial-Dirichlet Bounds for Dollar-Unit Sampling in Auditing

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ABSTRACT: This paper takes a Bayesian approach to incorporate auditors' prior information in constructing error bounds for the proportion of dollar amount overstated (equivalently, the total amount overstated) in an accounting population. The multinomial distribution model within the dollar-unit sampling framework suggested by Fienberg, Neter, and Leitch [1977] is used, and the prior distribution belongs to the class of Dirichlet distributions. The properties of the resulting Bayesian bounds are discussed. Some comparisons of tightness of bounds are made with the multinomial and the modified multinomial bounds [Leitch, et al., 1982]. Simulation results suggest that some of the Bayesian bounds have good repeated sampling properties. In particular, in repeated sampling, a Bayesian bound gives a significance level close to the nominal level for many typical accounting populations. Another advantage of the suggested approach is computational efficiency which is independent of the sample size and the number of errors found in the sample.

In audit sampling, obtaining good upper bounds on the overstatement errors of account totals is an important problem. A natural approach would be to take as error bounds the confidence limits of classical survey sampling estimators, such as mean-per-unit, stratified mean-per-unit, ratio, or difference estimators, assuming that these estimators are approximately normally distributed for large samples. However, Kaplan [1973] and Neter and Loebbecke [1975] have empirically found the performances of these bounds to be unsatisfactory when the error rates are small or moderate, as they are in many accounting populations.[1] The unsatisfactory performances are consistent with the theoretical results of Hájek [1960] and Scott and Wu [1981]. Hájek [1960] gives necessary and sufficient conditions for the mean-per-unit estimator (and hence for the difference estimator) to be approximately normal for large samples, and Scott and Wu [1981] give sufficient conditions for the ratio or regression estimator to be approximately normal for large samples. These conditions from statistical theory are not satisfied by populations with low or moderate error rates. Thus, the poor performances of

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[1] See Neter, Leitch, and Fienberg [1978] for a more detailed discussion.

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the normal-approximation confidence limits as error bounds may stem from a poor normal approximation.

Dollar-unit sampling[2] was proposed in response to the special nature of accounting populations. Within the framework, several types of error bounds have been suggested. Of these, the best known is Stringer's bound.[3] The theoretical distribution properties of Stringer's bound are not well understood, but a number of simulation studies (e.g., Neter and Loebbecke [1975]; Reneau [1978]) have shown that the bound is overly conservative. That is, the actual level of significance is greater than the nominal level of significance.

Fienberg, Neter, and Leitch [1977] used a multinomial distribution model and proposed a multinomial bound as an alternative to Stringer's bound. Neter, Leitch, and Fienberg [1978] further developed the results of Fienberg, Neter, and Leitch [1977] and provided empirical evidence that their proposed bounds are usually tighter than Stringer's bound.

The major difficulty encountered in the use of the multinomial bound is computational. The procedure involves constructing an *S*-set[4] which is not uniquely defined; the complexity of the ensuing computation depends on the size of *S*, which in turn increases with the number of errors in the sample. The procedure suggested in Neter, Leitch, and Fienberg [1978] can handle up to eight errors. Leitch, et al. [1982] use a clustering procedure to reduce the size of the *S*-set, and can thereby handle up to 25 to 30 errors. The tradeoff, however, is that the resulting modified multinomial bound is not as tight as the original multinomial bound.

Auditors invariably have prior knowledge about various aspects of accounting populations. This prior knowledge often can be used profitably in the construction of the bounds for the population total error amount. Thus, a Bayesian approach is appropriate. That is, the prior distribution should be assessed and combined with the sample information to derive a posterior distribution of the parameter of interest (e.g., the total error amount, or, equivalently, the proportion of total error amount). Inferences are then based on this posterior distribution. The error bounds obtained in this way are called Bayesian bounds.

There is relatively little research on constructing Bayesian bounds when the sampling method is dollar-unit sampling. Cox and Snell [1979] propose a Bayesian bound using a prior distribution on the population error rate and the error tainting amount. Their results, however, are based on a number of simplifying assumptions. Godfrey and Neter [1983] discuss the assumptions and modify the Cox-Snell approach in various ways. They also provide a thorough discussion of the current literature on Bayesian approaches to audit sampling. The papers discussed include Kinney [1975a,b], Scott [1973], Felix and Grimlund [1977], Garstka [1977], and Vanacek [1978]. These results are based on either different sampling distribution models or different prior distributions.

Godfrey and Neter [1983] also point out the significant difference in interpreting the results obtained from a Bayesian approach and those obtained from a frequentist approach (based on repeated sampling performance).

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[2] Neter, Leitch, and Fienberg [1978] provide a brief review of dollar-unit sampling. A fuller exposition can be found in Leslie, Teitlebaum, and Anderson [1979].

[3] See Neter, Leitch, and Fienberg [1978] for a description of Stringer's bound.

[4] For a discussion of the choice of an *S*-set, see Fienberg, Neter, and Leitch [1977] and Leitch, et al. [1982].

Roughly speaking, the frequentist approach views D, the true proportion of dollar amount in error, as a fixed constant, and justifies its procedures on the basis of a large number of imaginary or hypothetical repeated samples, X, *not* only on the actual sample observed. The frequentist approach provides a $100(1-\alpha)$ percent confidence interval for D, $\{d: d \leq D^*_{1-\alpha}(X)\}$, where $D^*_{1-\alpha}(X)$ is viewed as random. Here, $100(1-\alpha)$ percent *confidence* refers to the repeated sampling performance of this procedure generating such intervals. That is, if there is repeated sampling from the same accounting population and forming of the associated confidence intervals, then $100(1-\alpha)$ percent of these intervals will cover D. For a particular sample, the associated confidence interval may *not* be said to cover D with probability $(1-\alpha)$.

In contrast, in the Bayesian approach, one argues that after the sample data are obtained, there is no further randomness in the data. Other imaginary or hypothetical samples which might have been obtained instead are irrelevant in the analysis and therefore should not be used to justify statistical procedures. The true proportion of dollar amount in error, D, is uncertain. Thus, it is appropriate to use a probability distribution to describe the uncertainty about D. Hence, conditioned on the prior distribution assessed and the sample information available, the auditor knows that with probability $(1-\alpha)$, D is less than the $100(1-\alpha)$ percentile, $D_{1-\alpha}(X)$, of the posterior distribution of D. The associated interval $\{d: d \leq D_{1-\alpha}(X)\}$ is said to have *credibility* $(1-\alpha)$. Since the data, X, are fixed at this point, the bound $D_{1-\alpha}(X)$ is viewed as a constant, though D remains uncertain.

The Bayesian $(1-\alpha)$ credibility intervals do not necessarily have $100(1-\alpha)$ percent confidence, from the repeated sampling point of view. If they do, however, the bound $D_{1-\alpha}(X)$ should appeal to both Bayesians and frequentists. Some of the Bayesian bounds described in this paper might be said to have this property.

Using the multinomial distribution model in dollar-unit sampling to construct error bounds has a number of advantages. Neter, Leitch, and Fienberg [1978, p. 80] identify the following desirable characteristics of their multinomial bound:

1) it incorporates information about the magnitude of the sample errors;[5]
2) it has distributional properties which are fully known; and
3) it does not require any assumptions about the distribution of the population or of the errors in the population.

In this paper, we combine the benefits of the multinomial model in dollar-unit sampling with the benefits of incorporating prior information via a Bayesian approach. It is assumed that all errors are overstatement errors and that the maximum tainting percentage is 100 percent.[6]

Our prior distribution belongs to the class of Dirichlet distributions.[7] Using this prior, an exact posterior distribution of the proportion of dollar amount in error can be derived. Although this posterior distribution is complicated, it can be approximated adequately by a simple distribution, the beta distribution. For practical purposes, the percentiles of this beta distribution can be used as the error bounds for the proportion of dollar error amount. As we shall see from our numerical studies, the 95th percentile of this beta distribution, for example, is extremely close to the 95th percentile of the true posterior distribution. Our procedure has the following features:

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[5] Although the dollar-unit sampling methods appear to use only the tainting of the error found in the sample in calculating the error bounds, the magnitude of the sample error is implicitly incorporated in the method through the sampling procedure. For example, a $250 overstatement error in a $1,000 account balance is (ten times) more likely to be picked up than a $25 overstatement error in a $100 account under the dollar-unit sampling procedure, even though the tainting value is 0.25 in both cases.

[6] See Neter, Leitch, and Fienberg [1978, p. 83 and p. 87] for extension of the results to handle overstatement errors in excess of 100 percent and understatement errors.

[7] See Appendix A for the relationship between the Dirichlet and multinomial distributions.

(A) In addition to the benefits of using the multinomial model mentioned earlier, computation of the percentiles of the beta distribution (and hence the upper error bounds) requires very little computing time, using an IMSL[8] program. In addition, the computing time is independent of the number of errors in the sample. This is in contrast to the multinomial bound method proposed by Neter, Letich, and Fienberg [1978]. Moreover, the computation does not involve an *S*-set.

(B) The auditor's experience and prior knowledge are incorporated by means of a prior distribution. The assessment of the Dirichlet distribution as a prior distribution is reasonably easy and natural to the auditor.

(C) According to our numerical studies, our Bayesian bounds are usually tighter than the multinomial or modified multinomial bounds. In addition, some of the Bayesian bounds are conservative even from the frequentist point of view. Moreover, our bounds are more reasonable than the multinomial or modified multinomial bound[9] when the population error rate is small or moderate (roughly, less than or equal to eight percent).

To introduce our results, we first briefly describe the multinomial model. The family of Dirichlet distributions is then introduced as a class of prior distributions, and the assessment of the prior distributions is discussed. In the following section, we examine the posterior distribution of the proportion of dollar amount in error and its approximation. The tightness of our Bayesian bounds is compared with that of the multinomial (or modified multinomial) bound and Stringer's bound. Some properties of the Bayesian bounds are discussed. Then, simulation studies using various typical accounting populations are reported. Some of the Bayesian bounds appear to have desirable repeated sampling properties. A summary and concluding remarks appear in a final section.

MULTINOMIAL DISTRIBUTION AND DIRICHLET DISTRIBUTION

The sample dollars sampled under dollar-unit sampling are put into one of several categories, according to the percentage (i.e., cents) of error tainting. More explicitly, let $c_0, c_1, \ldots, c_m$ be $m+1$ constants such that $c_0=0<c_1<\ldots<c_m=100$. Here, $m+1$ is the number of categories desired. The sample dollar is put into category c_0 if there is no error, and is put into category c_i (for $i \geq 1$) if the percentage of the error tainting is greater than c_{i-1} but less than or equal to c_i. Let $p_0, p_1, \ldots, p_m$ denote the population proportions of dollar units belonging to categories $c_0, c_1, \ldots, c_m$, respectively, where $\sum_{i=0}^{m} p_i=1$ and $p_i \geq 0$ for all i. To

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[8] IMSL (International Mathematical and Statistical Libraries) is a set of computational subroutines written in FORTRAN.

[9] The smallest multinomial bound is $29,513 (see Leitch, et al., 1982) for a population of one million dollars in total book value, which is too conservative when the population error rate is small.

clarify the meaning of this notation, consider the following example.

Example A. If $m+1=101$, as considered by Fienberg, Neter, and Leitch [1977], then the constants $c_0=0$, $c_1=1$, $c_2=2, \dots, c_{100}=100$ might be used, and an error of 65.4 cents would be classified into category c_{66}. Suppose the accounting population of interest has a total book value of $2,000. Suppose further that of the 2000 dollar-units, 13 have 15 cents in error, eight have 50 cents in error, seven have 100 cents in error, and the remaining are without error. Then $p_0=1972/2000=.986$, $p_{15}=13/2000=.0065$, $p_{50}=8/2000=.004$, $p_{100}=7/2000=.0035$, and $p_i=0$ for all i not equal to 0, 15, 50, or 100. The error rate in this example is the number of dollar units in error, divided by 2000, that is, $(13+8+7)/2000=1.4$ percent.

For a random sample of dollar units of size n, let $z_0, z_1, \dots, z_m$ denote the observed counts of the dollar units in the $m+1$ categories $\left(\text{i.e., } \sum_{i=0}^{m} z_i=n\right)$. As Fienberg, Neter, and Leitch [1977] note, the distribution of the z_i's is exactly multinomial given the p_i's and n, if the sampling is with replacement. If sampling is without replacement and n is small compared to the number of dollars in the population, then the distribution of the z_i's is approximately multinomial. In other words, the probability of observing $z_0, z_1, \dots, z_m$ given $p_0, p_1, \dots, p_m$ is

$$u-c-(z_0, z_1, \dots, z_m | p_0, p_1, \dots, p_m) = n! \prod_{i=0}^{m} p_i^{z_i} / z_0! \dots z_m!, \quad (1)$$

where the z_i assume nonnegative integer values and the sum of the z_i is n. Let

$$D = \sum_{i=0}^{m} c_i p_i / 100. \quad (2)$$

The true proportion of dollar amount in error is at most D; the goal is to find a good error upper bound for D. The upper bound of the total dollar amount in error can then be obtained by multiplying the upper bound for D by the total book value of the accounting population. In Example A above, $D=\$12.95/\$2000=.006475$, which is exactly the true proportion of dollar amount in error. The amount in error is equal to $2000D=\$12.95$.

Now suppose that the auditor has prior information on the true tainting proportions, p_i, and that the joint distribution of the p_i can be described by means of a Dirichlet distribution,[10] $\text{Dir}(K\alpha_0, \dots, K\alpha_m)$, with appropriate choices of parameters $K, \alpha_0, \dots, \alpha_m$, where $K>0$, $\alpha_i \geq 0$ for all i, and $\sum_{i=0}^{m} \alpha_i=1$. The α_i's are the prior guesses of the p_i's, and a relatively large K implies that the prior guesses are fairly sharp. The constant K can be viewed as the weight of the prior information as compared to that of the sample information (which can be measured by the number of dollar units, n, sampled). The constant K is usually chosen to be much smaller than n to reflect that the sample information is more reliable.

The multinomial model (1) with $m=100$ is rich enough to produce reasonably tight error bounds. Therefore, we will only consider the case $m=100$, with $c_0=0$, $c_1=1$, $c_2=2, \dots,$ and $c_{100}=100$. The multinomial model with a smaller value of m contains fewer parameters, and consequently, it is easier for the auditor to assess the corresponding prior distribution. The tradeoff is that the resulting error bounds are less tight. Different values of c_i's can also be used in the multinomial model, but we will not pursue that modification here. Examples of the choices of the values of K, $\alpha_0, \ldots,$ and α_{100} which characterize the prior distribution are given below. The number of sample dollar units will generally be taken to be $n = 100$. Various priors were examined in an effort to find Bayesian bounds which are similar in magnitude to the multinomial or modified multinomial bound.

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[10] See Press [1972, pp. 133–134] for the properties of the Dirichlet distribution. The formulas for the mean and the variance of each p_i and the covariance of p_i and p_j are given in Appendix A. Our notation corresponds to his as follows: $K\alpha_i=v_{i+1}$, and $p_i=x_{i-1}$.

Example 1. Suppose the α_i's are chosen to be equal and that K is small, say 0.2525.[11] This reflects that the auditor has a nearly noninformative prior; a smaller value of K would mean that he or she is even more uncertain about the prior guesses α_i. With a small value of K, the Bayesian bound depends heavily on the sample information. If there is no error or there are only a few errors with small taintings, then the Bayesian bound is very tight when K is small. Thus, if the accounting population actually has a low error rate and errors with small taintings, then the Bayesian bound gives very accurate results. On the other hand, if the true accounting population has a high error rate or errors with large taintings, then the sample described above is not representative of the accounting population, and the resulting bound may be overly small.

Example 2. If the auditor chooses $\alpha_0 = 0.8$, $\alpha_i = 0.2/100 = 0.002$, for $i = 1, \ldots, 100$, and $K = 5$, this means that the auditor believes that about 80 percent of the dollar units in the population are without error and that the true error tainting proportions $p_1, \ldots, p_{100}$, are roughly the same. Moreover, $K = 5$ means that the auditor is fairly confident about the guesses of the p_i's.

Example 3. Suppose $K = 5$, $\alpha_0 = 0.8$, $\alpha_i = 0.1/100 = 0.001$, for $i = 1, \ldots, 99$, and $\alpha_{100} = 0.1 + 0.1/100 = 0.101$. This means that the auditor has a similar prior distribution as in Example 2, except that now the auditor believes that about ten percent of the dollar units in the accounting population have 100 percent (i.e., cents) error taintings. If the auditor thinks that more dollar units have 100 percent error tainting, then a higher value for α_{100} should be chosen.

These examples were chosen to demonstrate the difference between weak and strong priors. Example 1 is an example of a weak prior in the sense that the prior information that the auditor incorporates is minimal in comparison to the expected information in the data. Such a prior results when K is chosen to be relatively small. In Example 1, $K\alpha_i = .0025$ was chosen for $i = 0, \ldots, 100$, which results in a value of $K = 0.2525$. In contrast, Examples 2 and 3 are examples of relatively strong priors, as reflected in the choice of $K = 5$, which is large in relation to $K = 0.2525$ in Example 1. Example 3 differs from Example 2 in its higher prior mean, α_{100}, of the proportion of 100 percent tainting, p_{100}. Based on the same data, the bounds in Example 3 are expected to be larger than the bounds in Example 2, because of the higher prior mean on the proportion of 100 percent taintings. With a weak prior, a higher prior mean on the proportion of 100 percent tainting would make relatively little difference on the computed bounds.

For a fixed K, a *conservative* prior is one which places high prior means on the proportions of larger taintings, such as p_{100}. In this sense, the prior in Example 3 is more conservative than the prior in Example 2.

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[11] We used $K\alpha_i = 0.0025$ in our computation for convenience. Since the index i runs from 0 to 100, we have $K = 0.2525$.

For ease of reference, the Bayesian bounds based on the prior distributions described in Examples 1, 2, and 3 will be denoted by B1, B2, and B3, respectively.

POSTERIOR DISTRIBUTION OF PROPORTION OF DOLLAR AMOUNT IN ERROR AND ITS APPROXIMATION

To derive the posterior distribution of the proportion of dollar amount in error, $D=\sum_{i=0}^{100} ip_i/100$, we first observe that the family of Dirichlet distributions is a class of conjugate priors[12] for the multinomial distribution. Let $z_0, \ldots, z_{100}$ be the observed counts of the n dollar units sampled falling in categories $c_0, \ldots,$ and c_{100}, respectively, and let the prior distribution of the proportions, $p_0, \ldots, p_{100}$, of dollars belonging to the 101 categories be $\mathrm{Dir}(K\alpha_0, \ldots, K\alpha_{100})$. Then the posterior distribution of the p_i is $\mathrm{Dir}(K\alpha_0+z_0, \ldots, K\alpha_{100}+z_{100})$, which can be rewritten as $\mathrm{Dir}(K'\alpha'_0, \ldots, K'\alpha'_{100})$, where $K'=K+n$ and $\alpha'_i=(K\alpha_i+z_i)/(K+n)$, $i=0, \ldots, 100$. The posterior density function of D, f_D, which is a linear combination of the p_i, can be derived (see Bloch and Watson [1967]). For ease of referral, the form and properties of the Dirichlet distribution are provided in Appendix A.

The exact form of the posterior density is very complicated to work with. However, the percentiles of the posterior distribution of D can be obtained by means of large computer simulations using the well-known relationship[13] between the Dirichlet distribution $\mathrm{Dir}(K'\alpha'_0, \ldots, K'\alpha'_{100})$ and 101 independent gamma distributions $G(K'\alpha'_0, 1), \ldots, G(K'\alpha'_{100}, 1)$ as described below. Here, $G(j, 1)$[14] means a gamma distribution with shape parameter j and scale parameter equal to 1.

Suppose that X_i has the gamma distribution $G(K'\alpha'_i, 1)$, $i=0, \ldots, 100$, and suppose that the X_i's are independent. Then the joint distribution of the proportions $p_i=X_i/\left(\sum_{j=0}^{100} X_j\right)$, $i=0, \ldots, 100$, is the Dirichlet distribution $\mathrm{Dir}(K'\alpha'_0, \ldots, K'\alpha'_{100})$. Hence, the Dirichlet distribution $\mathrm{Dir}(K'\alpha'_0, \ldots, K'\alpha'_{100})$ can be generated by generating the 101 independent gamma variables $X_0, \ldots, X_{100}$.

In our study, we generated 10,000 independent realizations of the X_i's. The empirical distribution of the linear combination

$$D=\sum_{i=0}^{100} ip_i/100=\sum_{i=0}^{100} iX_i/\left(100\sum_{j=0}^{100} X_j\right)$$

was then obtained, and the percentiles of this empirical distribution were used as the true percentiles of the posterior distribution of D. Our numerical studies show that such results are reliable.[15]

Since the exact posterior density of D is too complicated to use, it is desirable to seek a good approximate density which has a simple form. We found that matching the first two moments (or the mean and the variance) of a beta distribution,[16] $B(a, b)$, with those of the posterior distribution of D results in a good approximation. Extensive numerical studies described below show that the percentiles of this beta distribution are very close to the (simulated) true percentiles of the posterior distribution of D (see Tables 3 and 4). Recall that the posterior distribution of the p_i's is $\mathrm{Dir}(K'\alpha'_0 \ldots, K'\alpha'_{100})$. The expected value and the variance of D are respectively equal to (see Appendix B):

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[12] See DeGroot [1970, pp. 174–175].

[13] See, for example, Press [1972, p. 134].

[14] See Press [1972, p. 134] for the probability density of the one-parameter gamma distribution $G(j,1)$.

[15] For more extreme percentile computations (e.g., 99.9th percentile), a larger number of realizations than 10,000 may be needed. For 95th percentiles, 10,000 realizations are sufficient to produce enough accuracy for practical purposes.

[16] See Appendix C for the probability density of the univariate beta distribution $B(a,b)$.

$$E(D) = \sum_{i=0}^{100} i\alpha'_i/100 \text{ and}$$
$$\mathrm{Var}(D) = 10^{-4}\left[\sum_{i=0}^{100} i^2\alpha'_i - \left(\sum_{i=0}^{100} i\alpha'_i\right)^2\right]/(K'+1). \tag{3}$$

The matching beta approximation $B(a, b)$ of the posterior distribution has the following values of a and b (see Appendix C):

$$a = E(D)\{E(D)[1-E(D)]\ /\mathrm{Var}(D) - 1\},$$
$$b = [1-E(D)]\{E(D)[1-E(D)]\ /\mathrm{Var}(D) - 1\}. \tag{4}$$

For example, suppose that a sample of 100 dollar units is chosen and that six dollar units are in error with taintings equal to 1, 1, 5, 11, 27, and 100 cents. In our notation, $z_0 = 94$, $z_1 = 2$, $z_5 = 1$, $z_{11} = 1$, $z_{27} = 1$, $z_{100} = 1$, and $z_j = 0$ for all other values of j. Suppose that the prior distribution described in Example 3 is used. Then $K' = 5 + 100 = 105$, $K'\alpha'_0 = K\alpha_0 + z_0 = 4 + 94 = 98$, $K'\alpha'_1 = K\alpha_1 + z_1 = .005 + 2 = 2.005$, $K'\alpha'_5 = K\alpha_5 + z_5 = .005 + 1 = 1.005 = K'\alpha'_{11} = K'\alpha'_{27}$, $K'\alpha'_{100} = K\alpha_{100} + z_{100} = .505 + 1 = 1.505$, and $K'\alpha'_i = .005$ for all i not equal to 0, 1, 5, 11, 27, or 100. The resulting beta approximation, $B(a, b)$, of the posterior distribution has $a = 2.7817$ and $b = 129.8309$. The 95th percentile of this beta distribution is 0.04462, while the (simulated) true 95th percentile of the posterior of D is 0.04450. That is, the Bayesian bound for the proportion of amount in error is about 0.0446. If the total book value of the accounting population is one million dollars, then the Bayesian bound for the total amount in error is approximately $44,600. Thus, based on the prior distribution in Example 3 and the sample information mentioned above, the auditor knows that with probability .95, the true dollar amount in error in the accounting population is less than $44,600. The interval $\{D: D < .0446\}$ is said to have credibility .95 (*not* .95 confidence).

We next discuss six properties of the bounds based on the percentiles of the beta approximation. We shall use the term "Bayesian bound" (e.g., *B*1, *B*2, or *B*3) both for the proportion of dollar amount in error and for the total amount in error. The context will make it clear which meaning is appropriate.

1. *Relationship of the Magnitude of the Bayesian Bound and its Credibility.* The higher the credibility, or equivalently, the higher the percentile, the larger will be the Bayesian bound for given error outcomes and sample size.
2. *Effect of Small Error Additions.* The Bayesian bounds increase only slightly when additional errors with small taintings are included with errors with large taintings (see Table 1(a)). For example, when 100 dollar units are sampled and two errors with 50 percent taintings are found, the Bayesian bound *B*3 for the total amount in error is $36,043 if the total book value is one million dollars. When two more errors with one percent tainting are found, *B*3 only increases by $163, to $36,206. In the same situation, the bound *B*2 increases by $165, and the bound *B*1 increases by $173. The differences reflect the different priors used. Bounds *B*2 and *B*3 are based on equally strong priors ($K = 5$), but *B*2 places higher prior means α_i on the proportions of small taintings. This probably

TABLE 1

PROPERTIES OF THE BAYESIAN BOUND

(SAMPLE SIZE = 100; .95 CREDIBILITY; BOUNDS IN 1000 DOLLARS; TOTAL BOOK VALUE = $1 MILLION)

Comparison	*Error in Cents*	*B1*	*B2*	*B3*
a) Small error addition	50,50	25.727	30.690	36.043
	50,50, 1, 1	25.900	30.855	36.206
	10,20,30,40	22.674	28.350	34.094
	10,20,30,40, 1, 1	22.849	28.519	34.259
b) Diversity of errors for the same number of errors and equal total dollar error	5,50,50,95	43.85	46.99	54.43
	10,50,50,90	43.50	46.35	50.83
	20,50,50,80	41.83	45.24	49.83
	30,50,50,70	40.89	44.43	49.09
	40,50,50,60	40.30	43.92	48.64
	50,50,50,50	40.10	43.75	48.48
c) Increase in number of equal errors where they sum to the same total dollar error	100	31.67	35.61	40.33
	50,50	25.73	30.69	36.04
	25,25,25,25	21.80	27.72	33.58
	20,20,20,20,20	20.87	27.06	33.05
	Ten 10's	18.74	25.56	31.95
	Twenty 5's	17.47	24.89	31.38

accounts for the bigger influence of the additional small errors on the bound *B*2. The bigger change in the bound *B*1 as compared to *B*3 stems from the relatively weak prior ($K = 0.2525$) used for *B*1. Since the prior is weak, the bound is more heavily influenced by the data. *B*1 thus more dramatically reflects the addition of small errors. Similar reasoning explains the same relative changes in the bounds when additional equal errors are added (Table 2).

3. *Effect of Diversity of Errors.* For a given number of dollar units in the sample, number of errors, and total sample error amount, the Bayesian bound becomes larger as the errors become more unequal. When the total sample error amount is fixed and the number of errors is allowed to vary, the Bayesian bound decreases as the number of errors increases. Both of these effects are illustrated in Table 1(b) and (c) for *B*1, *B*2, and *B*3.
4. *Effect of Additional Equal Errors.* For a fixed sample size, the Bayesian bound increases by a decreasing amount of each additional error. This is illustrated in Table 2.[17]

To examine the closeness of the percentiles of the beta approximation and the (simulated) true posterior distribution, we computed *B*1, *B*2, and *B*3 with .95 and .99 credibility (i.e., the 95th percentile and the 99th percentile of the posterior distribution of *D*) based on a sample of 101 dollar units with two dollar units having error taintings d_1 and d_2, respectively. We report these bounds in Table 3, together with the corresponding multinomial bounds and Stringer's bound[18] (with confidence coefficients .95

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[17] Stringer's bound has properties similar to (1.) through (4.).

[18] The multinomial bounds and Stringer's bounds are from Table 2 of Fienberg, Neter, and Leitch [1977, p. 301]. Their computations of Stringer bounds are based

TABLE 2

EFFECT OF ADDITIONAL EQUAL ERRORS ON BAYESIAN BOUNDS
(SAMPLE SIZE = 100; 0.95 CREDIBILITY; BOUNDS IN 1000 DOLLARS; TOTAL BOOK VALUE = $1 MILLION)

	B1		*B2*		*B3*	
Error in Cents	*Bound*	*(Amount of Increase)*	*Bound*	*(Amount of Increase)*	*Bound*	*(Amount of Increase)*
(a) 50	17.58		23.66		29.55	
50 50	25.73	(8.15)	30.69	(7.03)	36.04	(6.49)
50 50 50	33.12	(7.39)	37.35	(6.66)	42.34	(6.30)
50 50 50 50	40.10	(6.98)	43.75	(6.40)	48.48	(6.14)
50 50 50 50 50	46.83	(6.73)	49.98	(6.23)	54.51	(6.03)
50 50 50 50 50 50	53.35	(6.52)	56.07	(6.09)	60.44	(5.93)
50 50 50 50 50 50 50	59.73	(6.38)	62.05	(5.98)	66.28	(5.84)
50 50 50 50 50 50 50 50	65.98	(6.25)	67.93	(5.88)	72.06	(5.78)
(b) 80	25.93		30.58		35.72	
80 80	39.36	(13.43)	42.76	(12.18)	47.27	(11.55)
80 80 80	51.37	(12.01)	53.93	(11.17)	58.09	(10.82)
80 80 80 80	62.66	(11.29)	64.53	(10.60)	68.46	(10.37)
80 80 80 80 80	73.49	(10.83)	74.75	(10.22)	78.51	(10.05)
80 80 80 80 80 80	83.98	(10.49)	84.68	(9.93)	88.31	(9.80)
80 80 80 80 80 80 80	94.22	(10.24)	94.39	(9.71)	97.92	(9.61)
80 80 80 80 80 80 80 80	104.25	(10.03)	103.92	(9.53)	107.37	(9.45)

and .99) for the purpose of comparing the tightness of the bounds. The binomial distribution was used for Stringer's bound in Table 3.

To discuss the Bayesian bounds based on a variety of error patterns and for ease of reference in our discussion of the numerical simulation studies, we use the following notation to describe some of the typical error patterns commonly encountered in practice.[19]

(a) *J*1 (*J*)[20]; *J*3 (unimodal). Let X_b^2 be a chi-square random variable with *b* degrees of freedom. The true distribution of taintings of dollars in the population is *Jb* if the distribution of taintings is $10X_b^2$, truncated at 100. That is, the maximum possible tainting is 100 percent. *J*1 has a reversed-*J* shaped pattern, while *J*3 has a unique mode at 30 cents.

(b) *J*1-100-20; *J*1-100-10; *J*1-100-30. The distribution *J*1-100-d represents a mixture of (100-*d*) percent of a *J*1 distribution and *d* percent of 100 percent taintings. Thus, *J*1-100-20 has a reversed-*J* shape with 20 percent of 100 percent taintings.

(c) Uniform. The true tainting (in cents) of a dollar unit in error is uniformly distributed from 0 to 100. That is, all overstatement taintings are equally likely.

(d) Unim30. This indicates that the true tainting (in cents) of a dollar unit in error has a chi-square distribution with 30 degrees of freedom (truncated at 100). This distribution has a unique mode at

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on the binomial distribution. The Stringer bounds in Table 4 of Neter, Leitch, and Fienberg [1978, p. 84] are based on the Poisson distribution, and are slightly larger than those in our Table 3.

[19] See also the discussion in Leitch, et al. [1982, p. 389].

[20] The notation described in parentheses is used in Leitch, et al. [1982]. Our notation is more informative about the tainting distributions used in our numerical studies.

TABLE 3

ERROR BOUNDS COMPARISON WITH SAMPLE SIZE = 101
(TOTAL BOOK VALUE = $1 MILLION; .95 AND .99 CREDIBILITY/CONFIDENCE*; BOUNDS IN 1000 DOLLARS)

Error in Cents		Stringer Bound**	Multinomial Bound	B1		B2		B3	
				Beta Approximation	Simulation Exact	Beta Approximation	Simulation Exact	Beta Approximation	Simulation Exact
					$\alpha = 0.05$				
d_1	d_2								
95	1	45.4	43.8	30.0	(29.2)	34.1	(34.1)	38.9	(38.8)
75	25	45.6	35.8	27.1	(26.7)	31.7	(31.8)	36.8	(37.0)
40	30	40.4	31.7	19.1	(19.1)	25.0	(24.7)	30.9	(31.2)
50	50	45.1	35.4	25.5	(25.4)	30.4	(30.2)	35.7	(34.8)
90	75	55.6	48.2	40.2	(40.1)	43.5	(42.9)	47.9	(48.4)
100	100	61.0	61.0	48.1	(48.4)	50.7	(51.0)	54.8	(54.6)
					$\alpha = 0.01$				
d_1	d_2								
95	1	63.1	60.7	44.6	(42.9)	48.2	(47.2)	54.4	(54.5)
75	25	63.3	51.1	38.2	(38.9)	43.2	(43.1)	50.1	(50.7)
40	30	57.4	47.0	26.5	(27.0)	33.9	(34.6)	42.2	(44.6)
50	50	62.7	50.7	35.1	(35.1)	40.8	(41.7)	48.0	(49.1)
90	75	74.6	64.5	55.3	(55.8)	58.2	(58.2)	63.8	(63.5)
100	100	80.7	80.7	66.0	(66.6)	67.9	(68.5)	72.9	(73.4)

* Credibility refers to the Bayesian bounds B1, B2, and B3. Confidence refers to the Stringer bound and the multinomial bound.

** Both the multinomial bounds and Stringer bounds are from Table 2 of Fienberg, Neter, and Leitch [1977, p. 301]. The Stringer bounds are based on the binomial distribution.

30. Although unim30 and J3 described in (a) above have similar means, J3 has a variance approximately ten times bigger than that of unim30.

(e) Unim10-100-20. This notation has a similar meaning as that in (b). Unim10 is defined in a similar fashion as unim30.

Using the above notation, a similar bounds comparison as in Table 3 is given in Table 4, using the typical sample error tainting patterns suggested in Leitch, et al. [1982, p. 399 (Appendix)]. From both Tables 3 and 4, we see that the Bayesian bounds obtained by using the beta approximation are very close to the bounds (percentiles) obtained by using the (simulated) true posterior distribution of the proportion of dollar amount in error. They are in fact practically identical for the various error patterns considered. Therefore, we can be confident in using the approximated beta distribution percentiles (especially the 95th percentile) as Bayesian bounds for the proportion of dollar error amount. The approximated beta distribution percentiles will be used in examining the repeated sampling performance of the Bayesian bounds in the following section.

From Tables 3 and 4, these further properties of the Bayesian bounds are observed:

5. *Effect of Additional Errors.* Generally, the Bayesian bounds increase in magnitude as additional errors are included.

6. *Role of Prior Information.* The

TABLE 4

ERROR BOUNDS COMPARISON WITH SAMPLE SIZE = 100
(TOTAL BOOK VALUE = $1 MILLION; .95 CREDIBILITY/CONFIDENCE*; BOUNDS IN 1000 DOLLARS)

				B1		*B2*		*B3*	
Tainting Patterns	*Error Rate*	*Stringer Bound***	*Modified Multinomial Bound*	*Beta Approximation*	*Simulation Exact*	*Beta Approximation*	*Simulation Exact*	*Beta Approximation*	*Simulation Exact*
J1(J)	6	38.9	36.6	14.9	(14.7)	22.2	(22.3)	28.4	(28.4)
J1-100-20	6	54.2	47.3	36.3	(36.8)	40.0	(40.5)	44.6	(44.5)
J3 (unimodal)	6	57.2	38.9	35.1	(35.3)	39.3	(39.6)	43.3	(45.0)
uniform	6	76.5	59.9	57.1	(56.6)	59.4	(59.1)	63.5	(63.3)
J1(J)	10	45.0	33.2	20.9	(20.9)	27.0	(27.0)	32.9	(33.3)
J1-100-20	10	60.0	50.0	40.7	(41.2)	44.2	(44.5)	48.7	(49.3)
J3 (unimodal)	10	73.9	53.1	51.2	(51.2)	54.1	(54.5)	58.6	(59.0)
uniform	10	103.6	86.1	83.0	(83.8)	83.9	(83.1)	87.6	(88.2)
J1(J)	15	52.0	37.7	27.7	(27.9)	32.9	(33.0)	38.5	(38.6)
J1-100-20	15	80.5	68.7	61.6	(62.5)	63.6	(63.8)	68.3	(69.3)
J3 (unimodal)	15	94.4	74.1	70.6	(71.5)	72.3	(73.2)	76.4	(76.4)
uniform	15	135.9	118.7	113.5	(113.5)	112.8	(112.1)	116.3	(116.7)
J1(J)	20	59.1	43.1	34.2	(34.5)	38.9	(39.0)	44.2	(44.3)
J1-100-20	20	87.1	74.7	66.9	(66.9)	68.7	(68.6)	72.6	(73.0)
J3 (unimodal)	20	113.7	97.7	88.6	(89.6)	89.3	(89.4)	93.2	(93.9)
uniform	20	167.1	150.5	142.7	(142.8)	140.7	(141.7)	143.9	(143.5)
J1(J)	25	65.9	49.0	40.4	(40.5)	44.6	(45.1)	49.7	(50.7)
J1-100-20	25	106.1	93.3	85.8	(87.4)	86.5	(86.4)	90.2	(90.9)
J3 (unimodal)	25	132.7	117.4	106.0	(106.3)	105.9	(107.0)	109.6	(109.4)
uniform	25	197.7	183.2	171.1	(171.8)	167.7	(168.4)	170.7	(171.5)

Bounds were computed using the typical sample error tainting patterns suggested in Leitch, et al. [1982, p. 399].

* Credibility refers to the Bayesian bounds B1, B2, and B3. Confidence refers to the Stringer bound and the modified multinomial bound.

** Both the modified multinomial bounds and Stringer bounds are from Leitch, et at. [1982]. The Stringer bounds are based on the Poisson distribution.

bounds *B*2 and *B*3 are based on equally strong priors ($K=5$), but *B*3's prior is more conservative than *B*2's because it places a higher prior mean on the proportion of 100 percent taintings. Thus, we expect that $B2 < B3$ whether the error rates are low or high. The differences between the bounds *B*1 and *B*3 (or *B*1 and *B*2) are large when the number of errors observed is small. One explanation is that when the number of errors is small, then the prior information plays an important role.

The differences between *B*1 and *B*3, and *B*1 and *B*2, are partly explainable in terms of weak and strong priors and partly explainable in terms of expected proportions of dollars in error (that is, $\sum_{i=1}^{100} i\alpha_i/100$). *B*3 depends on a strong prior ($K=5$) with an expected proportion of dollars in error of .151, while *B*1 depends on a weak prior ($K=.2525$) with an expected proportion of dollars in error of .50. If the proportion of dollars in error in the sample is less than .151, then the relatively strong prior used for *B*3 exerts influence and generally results in a larger bound *B*3 than *B*1, whose magnitude

TABLE 5

TRUE TOTAL AMOUNT IN ERROR OF ACCOUNTING POPULATIONS
(TOTAL BOOK VALUE = $1 MILLION; BOUNDS IN 1000 DOLLARS)

Error Rate	*J1*	*J1-100-20*	*Uniform*	*J3*	*J1-100-10*	*J1-100-30*
1%	0.98	2.79	5.0	2.83	1.89	3.69
3%	2.95	8.36	15.0	8.48	5.65	11.06
5%	4.92	13.93	25.0	14.13	9.42	18.44
7%	6.88	19.51	35.0	19.79	13.19	25.82
9%	8.85	25.08	45.0	25.44	16.96	33.19
10%	9.83	27.86	50.0	28.27	18.85	36.88
11%	10.81	30.65	55.0	31.10	20.73	40.57
12%	11.80	33.44	60.0	33.92	22.62	44.26
13%	12.78	36.22	65.0	36.75	24.50	47.95
14%	13.76	39.01	70.0	39.58	26.39	51.63
15%	14.75	41.80	75.0	42.40	28.27	55.32
20%	19.66	55.73	100.0	56.54	37.69	73.76

essentially depends on the data, since $B1$ is based on a weak prior. The larger the difference between .151 and the sample proportion of dollars in error, the larger the difference between $B1$ and $B3$. This explains the relationships between $B1$ and $B3$, and similarly between $B1$ and $B2$ in Table 4.

If the sample proportion of dollars in error is close to or greater than .151 (e.g., for the uniform tainting pattern with a 30 percent or higher error rate, it is expected to be at least (30%)(.5) = .150), then the relatively strong prior used for $B3$ again exerts heavy influence, but this time results in a slightly *smaller* bound $B3$ than $B1$. That is, $B1$ and $B3$ are similar in magnitude for high error rates, but $B1 > B3$ with a uniform tainting pattern. $B3$ and $B1$ appear to be similar in magnitude even when the error rate is as low as 25 percent (see Table 4, last row).

From both Tables 3 and 4, we see that our Bayesian bounds are generally tighter than the multinomial or modified multinomial bounds. The Bayesian bound $B3$, based on the relatively conservative prior given in Example 3, is actually very close in magnitude to the multinomial/modified multinomial bound (although the multinomial/modified multinomial bound is based on a frequentist approach). Based on this observation, one question of interest is: Does $B3$ have similar repeated sampling performance as the modified multinomial bound? In other words, if the prior in Example 3 is fixed, and if a sample of 100 dollar units is chosen from a fixed audit population repeatedly, is the percentage of times that the Bayesian bound $B3$ exceeds the true proportion of error amount very close to the confidence coefficient of the modified multinomial bound? If that is so, then since the computation of the Bayesian bound $B3$ is much easier than that of the modified multinomial bound, auditors who believe in the frequentist approach (rather than the Bayesian approach) and find the multinomial approach appealing, should find $B3$ attractive. In the next section, extensive simulation studies that we performed are reported in order to offer evidence that the answer to the above question is affirmative for various audit populations. In fact, the Bayesian bound $B3$ seems to have a confidence coefficient at least as high as the nominal

TABLE 6

OBSERVED PERCENTAGES OF TIMES IN 500 REPLICATIONS THE BAYESIAN BOUNDS EXCEED THE TRUE PROPORTION OF AMOUNT IN ERROR FOR TRUE TAINTING DISTRIBUTIONS J1, J1-100-20, UNIFORM AND J3 (THE PERCENTAGES WITHIN PARENTHESES ARE FOR SAMPLE SIZE 200 WHILE THE OTHERS ARE FOR SAMPLE SIZE 100; TOTAL BOOK VALUE = $1 MILLION; .95 CREDIBILITY)

	J1			*J1-100-200*			*Uniform*			*J3*		
Error Rate	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*
1%	100	100	100	100	100	100	100	100	100	100	100	100
	(100)	(100)	(100)	(100)	(100)	(100)	(83.8)	(100)	(100)	(100)	(100)	(100)
3%	100	100	100	84.6	100	100	87.2	100	100	93.8	100	100
	(100)	(100)	(100)	(78.2)	(99.0)	(100)	(92.2)	(95.4)	(97.8)	(92.2)	(100)	(100)
5%	100	100	100	77.6	100	100	91.2	94.0	98.8	90.6	100	100
	(97.0)	(100)	(100)	(87.6)	(90.4)	(96.8)	(89.6)	(95.6)	(97.0)	(92.8)	(97.8)	(99.8)
7%	99.8	100	100	82.4	93.0	100	90.6	95.6	98.6	93.0	97.4	100
	(95.8)	(100)	(100)	(89.4)	(93.6)	(96.2)	(92.4)	(96.8)	(97.6)	(93.6)	(97.6)	(99.4)
9%	98.2	100	100	88.6	92.6	98.2	92.2	96.4	98.0	93.0	99.0	100
	(95.4)	(100)	(100)	(89.6)	(92.2)	(97.8)	(93.8)	(96.8)	(96.4)	(95.4)	(97.6)	(99.6)
10%	96.8	100	100	90.0	91.4	96.6	92.0	96.4	97.6	92.0	97.5	98.4
	(94.4)	(99.8)	(100)	(91.6)	(93.6)	(96.6)	(92.6)	(94.2)	(95.6)	(94.0)	(96.4)	(97.0)
11%	97.6	100	100	91.6	91.6	95.4	93.0	94.6	97.2	93.2	97.4	99.8
	(94.8)	(100)	(100)	(92.6)	(95.0)	(96.0)	(95.4)	(95.0)	(97.0)	(94.0)	(96.4)	(98.2)
12%	96.4	100	100	91.2	93.1	95.3	93.8	94.8	96.4	94.6	98.4	99.6
	(96.8)	(99.6)	(100)	(92.8)	(95.1)	(95.8)	(94.4)	(94.6)	(95.0)	(96.2)	(96.6)	(98.4)
13%	96.0	100	100	92.8	92.8	95.4	92.8	95.6	97.4	94.0	98.4	98.8
	(94.8)	(99.6)	(100)	(92.2)	(94.4)	(95.4)	(93.6)	(95.6)	(96.4)	(93.6)	(97.2)	(97.8)
14%	97.6	100	100	92.8	95.2	96.6	92.8	95.0	97.2	93.2	97.4	98.6
	(96.8)	(99.8)	(100)	(92.2)	(94.0)	(95.8)	(95.6)	(93.4)	(95.8)	(94.2)	(96.0)	(99.0)
15%	97.0	100	100	90.6	94.2	97.4	93.2	93.2	95.0	94.4	96.8	98.8
	(96.6)	(99.4)	(100)	(92.0)	(95.4)	(96.4)	(94.2)	(94.8)	(96.2)	(94.4)	(96.2)	(98.2)
20%	95.2	100	100	92.2	94.4	96.0	93.8	93.8	95.2	95.2	95.6	98.0
	(96.6)	(98.4)	(100)	(95.8)	(93.4)	(96.8)	(94.2)	(95.2)	(95.2)	(94.6)	(95.8)	(95.4)

level for all the accounting populations considered. The bound *B*3 thus appears to be robust.[21] Repeated sampling performances for the Bayesian bounds *B*1 and *B*2 are also given.

FREQUENTIST PROPERTIES OF BAYESIAN BOUNDS

To study the long-run frequency properties of our Bayesian bounds, we performed computer simulations. The simulation studies were designed partly to facilitate comparisons to the simulation results for the modified multinomial bound of Leitch, et al. [1982]. We assumed that the total number of dollar units in the population was much greater than the number of dollar units in the sample. Hence, the accounting population could be treated as infinitely large, and the tainting of a dollar unit in error could be viewed as being generated from a distribution such as *J*1 or *J*1-100-20, which were described in the previous section.

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[21] See the discussion in Godfrey and Neter [1983, p. 27]. We interpret "the probability of a Bayesian bound being correct" to be the percentage of times the Bayesian bound is greater than or equal to the true proportion of amount in error in repeated sampling.

Each accounting population was characterized by an error rate (the proportion of dollar units in error) and a tainting distribution for the dollar units in error. The tainting distribution was chosen from among those described in the preceding section. The true proportion of amount in error is obtained by multiplying the error rate by the expected value of the tainting distribution. Thus, if the error rate is eight percent and the tainting distribution is uniform, then the true proportion of amount in error is $(0.08)(0.5)=0.004$, since the expected value of the uniform is 50 cents, or 0.5 dollars. The amounts in error for accounting populations with total book value of one million dollars, various error rates, and tainting distributions *J*1, *J*1-100-20, uniform, *J*3, *J*1-100-10, and *J*1-100-30 are provided in Table 5 for reference.

After the error rate, *e*, and the tainting distribution were fixed, a sample of dollar units was generated. For each dollar unit in the sample, a random number between zero and one was generated. If the random number was greater than or equal to *e*, then the dollar unit was considered to be without error. Otherwise, the dollar unit was considered to have tainting, and the amount of the tainting was generated according to the pre-chosen error distribution. This procedure was repeated until the desired number of dollar units was obtained. For most of the simulations, we generated samples of 100 dollar units. For certain populations, samples of 200 dollar units were generated in order to study the effect of sample size on the frequentist properties of the Bayesian bounds.

A total of 500 such independent samples (of size 100 or 200 dollar units) were generated in this manner. For each sample generated, the Bayesian bounds *B*1, *B*2, and *B*3 were calculated. The percentage of times out of 500 that the bounds exceeded the true proportion of amount in error are recorded in Table 6, for tainting distributions *J*1, *J*1-100-20, uniform, and *J*3. These percentages can be viewed as the coverage percentages of the associated Bayesian intervals. The first row associated with each error rate contains percentages for samples of 100 dollar units, while the second row (in parentheses) contains percentages for samples of 200 dollar units. The simulation results for other tainting distributions with samples of 100 dollar units are reported in Table 7.

Table 6 indicates that the coverage percentages of the intervals associated with the bounds *B*1, *B*2, and *B*3 differ more when the error rates are low than when they are relatively high. This observation is consistent with the pattern of magnitudes of bounds in Table 4. In general, the increase of sample size from 100 to 200 does not greatly change the coverage percentages of Bayesian intervals using bounds *B*1, *B*2, and *B*3. However, for each fixed error rate, the percentages associated with *B*1, *B*2, and *B*3 are generally relatively closer to one another when the sample size is increased to 200. This may be because more sample information is available, so that the influence of the priors is less pronounced.

When the tainting distribution is *J*1, the coverage percentage of the interval associated with *B*1 is close to the nominal level of .95 for almost all population error rates. For other types of tainting distributions (e.g., uniform), another choice of prior distribution, and hence a different Bayesian bound (e.g., *B*2), can

TABLE 7*

OBSERVED PERCENTAGES OF TIMES IN 500 REPLICATIONS THE BAYESIAN BOUNDS EXCEED THE TRUE PROPORTION OF AMOUNT IN ERROR FOR TRUE TAINTING DISTRIBUTIONS J1-100-10, J1-100-30, UNIM30 AND UNIM10-100-20
(SAMPLE SIZE 100; TOTAL BOOK VALUE = $1 MILLION; .95 CREDIBILITY)

	J1-100-10			*J1-100-30*			*Unim 30*			*Unim10-100-20*		
Error Rate	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*	*B1*	*B2*	*B3*
1%	100	100	100	100	100	100	100	100	100	100	100	100
3%	100	100	100	70.2	100	100	95.4	100	100	100	100	100
5%	87.2	100	100	83.8	92.0	100	95	100	100	93.8	100	100
7%	82.0	100	100	88.8	93.4	95.6	94.8	99.6	100	85.4	95	100
9%	84.8	99.0	100	93.0	95.4	94.2	96	99	99.8	78	89	99.4
10%	83.6	97.2	100	90.4	93.8	95.0	96	99.2	100	79.2	90	98
11%	81.2	96.6	100	90.2	92.8	97.0	95	98.6	100	80.8	90.4	94.8
12%	86.0	95.0	100	89.4	92.6	95.8	97.2	99	100	80.4	93.2	95.2
13%	85.6	93.4	99.6	93.2	94.8	95.8	94.4	98.6	99.4	80.6	92.4	94.2
14%	86.2	93.8	99.4	92.6	94.8	95.2	96	97.6	99.4	78.4	93	94.9
15%	83.8	93.8	98.4	92.0	94.8	94.6	94.4	98.2	98.8	84.6	95.2	96
20%	92.0	95.0	96.6	93.8	94.6	95.2	96.4	97.2	98.8	87.2	93.8	96

* Results for simulation studies with other true tainting patterns (unim10, unim40, unim50, unim10-100-10, and unim10-100-30) may be obtained from the authors.

lead to similar results. Thus, if the auditor can provide an appropriate prior distribution, then the desired level of coverage can be achieved. This is in contrast to the multinomial bound or modified multinomial bound, where the coverage percentages of their associated intervals are 100 percent for populations with error rates below a certain value. For example, the modified multinomial bound has a coverage percentage of 100 percent for tainting distribution *J*1 and for error rates not exceeding 29.5 percent, according to Table 7 of Leitch, et al. [1982]. A critical factor, of course, is the choice of the "appropriate" prior. The reason that the Bayesian bounds *B*1, *B*2, and *B*3, can be tighter is that their minimum bounds (bounds when no errors are observed) are smaller than the minimum multinomial bound (see Table 8 for a comparison). Depending on the choice of prior, the minimum Bayesian bound can be adjusted. Tables 6 and 7 show that the Bayesian bound *B*3 gives coverage percentages very close to or greater than .95 for a variety of tainting distributions and for many different error rates.

Simulation studies were performed to examine the repeated sampling properties of the Bayesian bounds, *B*1, *B*2, and *B*3, for .90 and .99 credibility with true tainting distributions *J*1, *J*1-100-20, uniform, and *J*3. In general, the discussion of the results in Table 6 still applies. In particular, when the true tainting distribution is *J*1, the coverage percentages of the intervals associated with *B*1 are generally close to the nominal levels (.90 and .99). Moreover, *B*3 gives coverage percentages very close to or greater than the levels .90 and .99 for the tainting distributions considered.

As remarked earlier, the bound *B*1 depends mainly on the sample information. If there are 100 percent tainting errors in the population, but

TABLE 8

MINIMUM BOUNDS FOR THE MULTINOMIAL BOUND AND BAYESIAN BOUNDS B1, B2, AND B3 (TOTAL BOOK VALUE = \$1 MILLION; SAMPLE SIZE = 100 OR 200; BOUNDS IN 1000 DOLLARS)

	Multinomial Bound	*B1*	*B2*	*B3*
Sample size = 100	29.5	6.6	15.9	22.7
Sample size = 200	14.9	3.3	8.2	11.6

none are observed in the sample (that is, the sample is unrepresentative), then the bound $B1$ will be too small. The problem of unrepresentative samples is especially serious when the population has a low error rate, together with a concentration of 100 percent tainting, since the presence or absence of a few 100 percent tainting errors in the sample can make a big difference in the bound.

Comparison of some of our simulation results for $B3$ with those for the modified multinomial bound results reported in Leitch, et al. [1982] suggests that, in repeated sampling, the Bayesian bound $B3$ has a confidence coefficient closer to the nominal level more of the time than does the modified multinomial bound. Thus, auditors who believe in good frequentist-property statistical procedures (rather than Bayesian procedures) should still find $B3$ appealing.

SUMMARY AND CONCLUDING REMARKS

This paper uses a Bayesian approach to construct upper bounds for the proportion of (or total) overstatement amounts within the dollar-unit sampling framework. Our analysis employs the multinomial distribution model for the distribution of dollar units in the sample. The auditor's prior knowledge of the error rate and the tainting distribution is incorporated via the Dirichlet distribution. Theoretically, this method of incorporating prior information should greatly improve the accuracy of the upper error bound for the proportion of amount in error. That is, the Bayesian bounds can be very tight, depending on the appropriateness of the prior distribution. Our numerical studies substantiate the benefits of this approach.

The Dirichlet distribution is determined by K, the relative weight of the prior information and α_i, the prior expected value of the proportion of dollar units with i percent taintings in the accounting population, $i=0, 1, \ldots, 100$. When K is small (say, about 0.25), the resulting prior is relatively weak, and the associated Bayesian bound depends heavily on the sample. Aside from K, the values of α_0 (recall that $(1-\alpha_0)$ is the prior mean of the error rate) and the α_i's for large i's (associated with large taintings) are the most critical. If the accounting population has a high error rate (greater than ten percent, say) and has a very low proportion of extreme taintings (e.g., the tainting pattern is $J1$ or unim30), then the dollar units in the sample should provide reasonably stable error information, and the Bayesian bound based on the relatively weak prior (with small K) will be very tight, and yet still accurate. On the other hand, if the auditor expects a substantial proportion (at least ten percent) of extreme taintings (e.g., the tainting pattern is $J1$-100-20), then a high value can be used for α_{100}. If the error rate is thought to be around 20 percent, then α_0 should be set equal to $(100\%-20\%)=0.8$. Moreover, K

should be chosen to be relatively large (e.g., K is about 5) if the prior information is to play an influential role. The resulting Bayesian bound is relatively conservative, but not overly so from a repeated sampling point of view.

Various Dirichlet priors (i.e., various choices of K, $\alpha_0, \ldots, \alpha_{100}$), and hence various Bayesian bounds, have been examined. Extensive simulation studies show that some of the Bayesian bounds also have some desirable frequentist properties. When the tainting distribution is reversed-J shaped, a weak prior as suggested in Example 1 results in bounds with a significance level close to the nominal level in repeated sampling. When the tainting distribution is uniform, the prior suggested in Example 2 provides bounds with similar frequentist properties. When the tainting distribution is a mixture of reversed-J shaped and 100 percent taintings, the prior suggested in Example 3 provides bounds with good repeated sampling performance. In fact, the Bayesian bound $B3$, using the prior in Example 3, has good frequentist properties for all the tainting distributions considered.

The proposed procedure allows the auditor to incorporate his or her best professional judgment in a scientific way. Although the resulting upper error bounds incorporating the auditor's prior information will produce accurate bounds if the prior information is accurate, an external auditor may be concerned about the defensibility of his or her prior choices of K, $\alpha_0, \ldots,$ and α_{100}. In that case, $B3$ can be used as an alternative to the multinomial bound [Feinberg, Neter, and Leitch, 1977] or the modified multinomial bound [Leitch, et al., 1982], since $B3$ is conservative from the frequentist point of view for the various typical error tainting patterns examined. If the auditor feels very certain from past experience that the tainting pattern of concern is either reversed-J shaped or unimodal, the bound $B1$ can be used. The auditor thus need not assess prior values explicitly, but instead can use the priors implicitly associated with $B1$ or $B3$.

Computational efficiency is another advantage of our approach, as compared to the multinomial approach of Fienberg, Neter, and Leitch [1977] and the modified multinomial approach of Leitch, et al. [1982]. Once the sample information is available and the assessed prior distribution is given (cf. Examples 1, 2, and 3), a simple FORTRAN program using an IMSL subroutine for beta distribution percentile computation produces the Bayesian bound in 0.1 CPU seconds on a VAX-11/750 computer. The entire computer program for computing the Bayesian bounds is not large, and therefore should be executable on a personal computer. If the IMSL subroutine to compute the percentiles of the beta distribution is not available, a similar subroutine can be used, or can be programmed without much difficulty.[22] Thus, our procedure should be readily usable, whether or not a main-frame computer is available.

Finally, our analysis not only provides upper error bounds for the proportion of the amount in error, D, but also provides the entire posterior distribution of D. This posterior distribution can be used to obtain other quantities of interest, such as the expected value, the variance, the median, or the mode of D. Moreover, cumulative posterior probabilities of D can be tabulated quickly (20 to 30 values can be computed in less than 2.0 CPU seconds) so that the auditor can appraise the magnitude of D.

---

[22] Computation of the beta percentiles basically involves single-dimensional numerical integrations of a well-behaved, smooth function over the interval (0,1). A computer program which does not use the special IMSL subroutine in the calculation of the Bayesian bounds is currently under development. Interested readers may contact the authors concerning the availability of the program.

APPENDIX A

A random vector $p=(p_0, \ldots, p_m)$ has a Dirichlet distribution $\mathrm{Dir}(K\alpha_0, \ldots, K\alpha_m)$ with parameters $K\alpha_0, K\alpha_1, \ldots, K\alpha_m$ ($K>0$, $\alpha_i>0$, $i=0, \ldots, m$, and $\sum_{i=0}^{m} \alpha_i=1$) if the probability density function $f(\cdot|K\alpha_0, \ldots, K\alpha_m)$ of p has the form:

$$f(p|K\alpha_0, \ldots, K\alpha_m)=\frac{\Gamma(K)}{\Gamma(K\alpha_0)\ldots\Gamma(K\alpha_m)} \prod_{i=0}^{m} p_i^{K\alpha_i-1} \tag{A1}$$

for $p_i>0$, $i=0, \ldots, m$, $\sum_{i=0}^{m} p_i=1$, zero otherwise. Here, $\Gamma(u)$ is the gamma function $\int_0^\infty x^{u-1}e^{-x}dx$. The first two moments of p_i are, respectively,

$$E(p_i)=\alpha_i \text{ and } E(p_i^2)=\alpha_i(K\alpha_i+1)/(K+1). \tag{A2}$$

Hence, the variance of p_i is $\mathrm{Var}\,(p_i)=\alpha_i(1-\alpha_i)/(1+K)$. Moreover,

$$E(p_ip_j)=K\alpha_i\alpha_j/(K+1) \text{ for } i\neq j. \tag{A3}$$

The covariance of p_i, p_j for $i\neq j$ is $\mathrm{Cov}\,(p_i, p_j)=-\alpha_i\alpha_j/(K+1)$.

Suppose $z_0, \ldots, z_m$ are observed counts from the multinomial distribution given in (1). Suppose further that the parameters $p_0, \ldots, p_m$ of the multinomial distribution follow a Dirichlet distribution as described in (A1). Then the posterior distribution of $p=(p_0, \ldots, p_m)$ is the Dirichlet distribution $\mathrm{Dir}(K\alpha_0+z_0, \ldots, K\alpha_m+z_m)$, which has the probability density function given by (A1) with $K\alpha_i$ replaced by $K\alpha_i+z_i$, $i=0, \ldots, m$. A proof of this result can be found in DeGroot [1970, pp. 174–175].

APPENDIX B

Suppose $p=(p_0, \ldots, p_{100})$ has the Dirichlet distribution $\mathrm{Dir}(K'\alpha'_0, \ldots, K'\alpha'_{100})$. To derive the mean and the variance of $D=\sum_{i=0}^{100} ip_i/100$, it suffices to derive the mean and the variance of $S=\sum_{i=0}^{100} ip_i$. For convenience, we use K instead of K' and α_i instead of α'_i in the derivations below. First, by (A2),

$$E(S)=\sum_{i=0}^{100} iE(p_i)=\sum_{i=0}^{100} i\alpha_i. \tag{B1}$$

Next,

$$
\begin{aligned}
E(S^2) &= E\left(\sum_{i=0}^{100} ip_i\right)^2 = \sum_{i=0}^{100} i^2E(p_i^2) + \sum_{i\neq j} ijE(p_ip_j) \\
&= \sum_{i=0}^{100} i^2\alpha_i(K\alpha_i+1)/(K+1) + \sum_{i\neq j} ijK\alpha_i\alpha_j/(K+1), \text{ by (A2) and (A3)} \\
&= \frac{K}{K+1}\left(\sum_{i=0}^{100} i^2\alpha_i^2 + \sum_{i\neq j} ij\alpha_i\alpha_j\right) + \sum_{i=0}^{100} i^2\alpha_i/(K+1) \\
&= \frac{K}{K+1}\left(\sum_{i=0}^{100} i\alpha_i\right)^2 + \frac{1}{K+1}\left(\sum_{i=0}^{100} i^2\alpha_i\right). \qquad \text{(B2)}
\end{aligned}
$$

Thus, from (B1) and (B2),

$$
\begin{aligned}
\text{Var}(S) &= E(S^2) - [E(S)]^2 \\
&= \frac{1}{K+1}\left[\left(\sum_{i=0}^{100} i^2\alpha\right) - \left(\sum_{i=0}^{100} i\alpha_i\right)^2\right].
\end{aligned}
$$

Finally, $\text{Var}(D) = 10^{-4}\text{Var}(S)$, as claimed in equation (3).

APPENDIX C

X has a beta distribution $B(a, b)$ with parameters $a>0$ and $b>0$ if it has probability density function of the form:

$$
f(x|a, b) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)}x^{a-1}(1-x)^{b-1}, \text{ for } 0<x<1. \qquad \text{(C1)}
$$

The mean and variance of X are, respectively,

$$
E(X) = \frac{a}{a+b} \text{ and } \text{Var}(X) = \frac{ab}{(a+b)^2(a+b+1)}. \qquad \text{(C2)}
$$

To approximate the distribution of D by the beta distribution given in (C1), we match their means and variances. Thus, using (C2), we set

$$
E(D) = \frac{a}{a+b} \text{ and } \text{Var}(D) = \frac{ab}{(a+b)^2(a+b+1)}. \qquad \text{(C3)}
$$

Solving the equations in (C3) for a and b in terms of $E(D)$ and $\text{Var}(D)$ yields the results in (4). It should be noted that calculation of the parameters a and b can be done on a hand calculator.

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EDUCATION RESEARCH

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Teaching Behavioral Aspects of Performance Evaluation: An Experiential Approach

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ABSTRACT: Based on a careful examination of the traditional approach to teaching behavioral aspects of performance evaluation, this paper concludes that there are some serious instructional gaps in teaching the topic. The paper argues that new pedagogical approaches based on student-generated experiences are effective in teaching behavioral aspects of accounting. Two experiential exercises developed by the author are also presented and discussed in the paper. Finally, the paper recommends development and wider adoption of experiential exercises in teaching behavioral aspects of accounting.

THE American Accounting Association Committees on the Behavioral Science Content of the Accounting Curriculum [1971] and the Relationship of Behavioral Science and Accounting [1974] have stressed the importance of integrating the behavioral sciences into accounting curricula. The 1974 committee felt that the traditional pedagogical approaches were inappropriate in teaching behavioral aspects of accounting, and recommended the use of experiential learning techniques such as laboratory training and simulation [pp. 137–138].

Experiential learning focuses on the creation of concrete experiences in the classroom to heighten students' awareness of themselves, as well as the specifics of the subject matter. This approach has evolved from an experimental stage in the 1950s and 1960s in personal growth centers, such as National Training Laboratories and the Esalen Institute, to being common practice in teaching the behavioral sciences [Walter and Marks, 1981]. The experiential learning model was later developed by Kolb [1974] to describe how experience is translated into concepts which in turn are used as guides in the choice of new experiences. Its principles and techniques are backed by modern theories of effective learning [Knowles, 1970, 1975].

The paper describes two experiential

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learning exercises which have been used successfully in MBA classes during the past two years. Both exercises deal with the topic of performance evaluation and provide the basis to generate sufficient classroom experience from which many behavioral concepts influencing performance evaluation could be inferred. The experiential approach seems to facilitate a higher level of student involvement, generate lively class discussion, and enhance the understanding of some difficult behavioral concepts. Further, the exercises use experiential data generated in the classroom to test the validity of hypotheses based on such behavioral concepts. Students tend to remember experiential exercises for a longer period of time, since it is far easier to remember an experience than a part of a lecture or some pages from a textbook [AAA, 1974]. As Coleman [1976, p. 58] points out, experiential learning is less easily forgotten because "the associations that embed it in memory are with concrete actions and events to which affect was attached, and are not merely associations with abstract symbols or general principles expressed in abstract symbols."

The next section of the paper identifies some instructional gaps in teaching performance evaluation. Some innovative pedagogical approaches developed during the past decade are presented in the following section. The two experiential learning exercises are then described and discussed.

SOME INSTRUCTIONAL GAPS IN TEACHING BEHAVIORAL ASPECTS OF PERFORMANCE EVALUATION

Traditionally, behavioral aspects of performance evaluation have been taught in accounting courses using assigned readings and lectures. This approach has several shortcomings. First, there is a misfit between the topic and the pedagogy. Castellano and Roehm [1977, p. 211] have pointed out that "the dynamic flavor of behavioral science as applied to accounting topics is quickly lost amidst a lecture, article-discussion format." The traditional approach has been found ineffective in teaching behavioral aspects of accounting:

> Some of the mediocrity of the existing behavioral science instruction in accounting stems from the sterility of the teaching methods; behavior is talked about rather than observed, felt, or experienced [AAA Committee Report, 1974, p. 138].

Second, although accounting instructors are aware of the importance given to performance evaluation by managers, textbooks do not pay sufficient attention to the topic. For example, Garrison [1976], a popular introductory managerial accounting textbook, devotes less than one page to discussing behavioral issues in a 21-page chapter on profit planning. Some accounting instructors may find this acceptable because they consider performance evaluation to be a behavioral topic to be taught in behavioral science courses. Such instructors apparently do not agree with the AAA committees' recommendations [1971, 1974] which stress the need for integrating behavioral sciences into accounting curricula. Unless such integration takes place, we have to use existing texts even though much of the information contained in them bears no relation to current accounting thought or practice [Copeland, 1969; and Most, 1974].

Third, the research and pedagogical approaches used in accounting and the behavioral sciences have evolved in very different directions. Although some topics such as performance evaluation are considered important in both disciplines, there is hardly any collaborative effort across the disciplines. Both of the AAA Committees [1971, 1974] have stressed the importance of integrating the existing knowledge in behavioral sciences into accounting curricula. However, despite some attempts[1] to bridge the gulf separating the two disciplines, the gap appears to be widening [AAA, 1974].

Finally, there is a widening gap between the state-of-the-art research in behavioral aspects of accounting and accounting curricula. Hirst [1981] has attempted to integrate various accounting studies dealing with performance evaluation. The richness of the conceptual and empirical content of accounting research brought out in Hirst's paper is not found either in management accounting textbooks or accounting courses using traditional pedagogical approaches.

Hence, there is reason to believe that there are some serious instructional gaps in teaching behavioral issues in accounting topics such as performance evaluation. The problem is likely to be more serious in the case of students who lack relevant experience, particularly from the business world [Grossman and Strawser, 1978]. Some recently developed pedagogical approaches seem to overcome the above deficiencies. These are described in the following section.

SOME INNOVATIVE PEDAGOGICAL APPROACHES IN ACCOUNTING

Fremgen, in his foreword to an AAA book by Gross and Gross [1980, p. vii], commented on the relative absence of innovative pedagogical approaches in accounting:

> The innovative instructional methods reported in this study were found in a wide variety of disciplines. All of them could be applied to accounting. Yet, the reader will find little mention of accounting in these pages. That may reflect a paucity of teaching innovations in our discipline or, at least, a lack of documentation of what has been done.

Despite strong recommendations from the AAA Committee on the Behavioral Science Content of the Accounting Curriculum [1971], only four articles on new approaches to teaching behavioral aspects of accounting [Virgil, Nord and Schoen, 1973; Castellano and Roehm, 1977; Grossman and Strawser, 1978; and Uecker, 1981] have appeared in THE ACCOUNTING REVIEW during the period 1971–82. All four articles reported that their experience in using non-traditional pedagogical approaches based on learning from special classroom situations provided sufficient evidence to convince them that their respective approach was superior to the traditional method.[2] Virgil, Nord and Schoen [1973] used a role-play format to teach a case on transfer pricing. Castellano and Roehm [1977] designed a field-based team project to help students in exploring some topics in behavioral aspects of accounting. Grossman and Strawser [1978] attempted to use the classroom as an illustrative example of one type of organization, and raised questions in several behaviorally relevant areas such as role of the instructor and evaluation of students. Uecker's [1981, p. 367] approach involved a behavioral decision simulation "to experience the process of choosing among alternative information systems for a decision maker." The simulation allows a student to compare his/her performance with optimal performance.

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[1] Such attempts include publications such as *Accounting, Organizations and Society* and AAA sections in Management Accounting, and Accounting, Behavior and Organizations. These efforts are mostly directed toward bridging gaps in research, though integrating behavioral concepts into accounting curricula is occasionally discussed in these journals and regional meetings.

[2] The traditional method as used here refers to a pedagogical approach that emphasizes assigned readings and lectures. The traditional method also assumes that concepts should be understood before learning applications.

Although these four approaches appear to be quite different, each of them exposed a student to one or more situations, so that the student could experience directly some of the behavioral implications. Unlike the traditional pedagogical approach which emphasizes learning the concepts and their applications first, these approaches started with student-generated experiences which were subsequently used as evidence to facilitate an understanding of the behavioral concepts involved. Students with negligible experience in business were not placed at a disadvantage when these approaches were used, since all students were exposed to the same situation. However, students interpret and draw conclusions from the situation in different ways, depending upon their backgrounds and what they felt or experienced during the exercises. The two exercises described in the next section are also experience-based and have been designed to teach behavioral issues in performance evaluation by first generating some concrete experience in the classroom and subsequently using the experience to infer relevant behavioral concepts and theoretical frameworks through further discussions and lectures.

TWO EXPERIENTIAL LEARNING EXERCISES

Both exercises have been designed to create relevant experiences which could be used subsequently in understanding several underlying behavioral issues. The first exercise (described in Appendix A) focuses on the subordinate's perception of his/her performance. Each student participates in the exercise so that the learning is based on one's own experience. The second exercise (presented in Appendix B) uses a role-play format to learn about the impact of superior-subordinate relationships on the performance evaluation process. Two student volunteers play the roles of a superior and a subordinate, respectively, while the remaining students observe and reflect on the role-play experience. The nature and extent of impact of the role-play on the observers could vary considerably. The instructor plays an important role after the exercise by facilitating a discussion of the experience in which the entire class participates. Several important behavioral concepts emerge during such a discussion.

Both exercises assume no prior knowledge of either behavioral concepts or performance evaluation practices in the industry. The two exercises could therefore be used either at a graduate or undergraduate level. At the undergraduate level, the instructor may have to provide more guidance during the class discussion. Depending upon the availability of time, one or both of these exercises could be used in a management accounting course.

CLASSROOM EXPERIENCE

The exercises were used in a graduate elective course called 'Management Control Systems' in two successive years. The exercises were used in the tenth and twelfth sessions of the 14-session course. By that time the class discussions had developed to a level where frankness and openness were acceptable. The assigned readings for the two sessions did not include any situation which appeared similar to the experiential exercises. This precaution was taken to ensure that students' experience during the exercise was not diluted by their readings. The assignments for the two sessions were as follows:

Session 10

Read:
- (a) Chapter 10 (Budget Preparation) and Chapter 16 (Nonprofit Organizations) from Anthony and Dearden, *Management Control Systems.*
- (b) Herzlinger, "Can We Control Health Care Costs?"
- (c) Hofstede, "Management Control of Public and Not-For-Profit Activities"

Case: Hyatt Hill Health Center (in Anthony and Dearden, *Management Control Systems*)

Experiential Exercise: Self-evaluation exercise

Session 12

Read:
- (a) Chapter 12 (The Budget in the Control Process) and Chapter 13 (Executive Incentive Compensation Plan), from Anthony and Dearden, *Management Control Systems.*
- (b) McGregor, "An Uneasy Look at Performance Appraisal"
- (c) Herzberg, "One More Time: How Do You Motivate Your Employees?"

Cases:
- (1) Bondsville Manufacturing Company (in Anthony and Dearden, *Management Control Systems*)
- (2) Cummins Engine Company

Experiential Exercise: Performance Evaluation, A Role-Play Exercise

Some instructors prefer to schedule experiential exercises during the second half of a three-hour class meeting with the hope that the dynamic nature of the experiential exercise will revive the energy level in the classroom. However, the experiential exercises in the above course were scheduled to be held at the beginning of the class, since some of the key concepts to be inferred from the experiential exercise were crucial in understanding and discussing the cases assigned for the class. For example, the Hyatt Hill Health Center (HHHC) case highlights the important role played by physicians in influencing the cost of patient care, as well as the need for self- or peer-control rather than organizational controls in evolving a balance between cost and quality of care. HHHC was established on an experimental basis to provide community-centered preventive health care to all residents in the community served by it. It relied mostly on external funding, and financial self-sufficiency and reduction of costs were important objectives. Costs could be measured and quantified with relative ease while quality of care was more subjective and non-quantitative in nature. The self-evaluation exercise was particularly relevant, since it dealt with both self-evaluation and the advantages of using quantitative and qualitative measures of performance.

The performance evaluation role-play exercise was similarly quite relevant in discussing the superior-subordinate relationship cases assigned for the twelfth session. The president of Bondsville Manufacturing Company was frustrated by the fact that the budgetary control system did not provide relevant information for evaluating the performance of divisional managers. Cummins Engine Company was faced with the problem of inventories getting out of control. The president of the company did not take any short-term measures to reduce inventories or penalize the managers.

TABLE 1

FREQUENCY TABLE OF STUDENT SELF-RATINGS

		Quantity of Class Participation				
		Well Above Average	*Above Average*	*Below Average*	*Well Below Average*	*TOTAL*
Quality of Class Participation	Well Above Average	1	4	1		6
	Above Average	2	7	6		15
	Below Average			3	1	4
	Well Below Average					0
	Total	3	11	10	1	25

Instead, he invested his time in slowly sensitizing his subordinates to the importance of inventory controls. Both cases dealt with leadership style, need for developing trust between the superior and the subordinate managers, and the importance of not relying exclusively on quantitative measures. The experience with the self-evaluation exercise is described below.

Student self-ratings in class participation were obtained in the self-evaluation exercise after going through the first three steps and are shown in Table 1 (please read Appendix A before proceeding further).

Students identified the following major trends once the data were displayed on the blackboard. The instructor did not offer any help in identifying the trends:

1. Only one student was in the 'well below average' category for quantity of class participation. None of the students were in the 'well below average' category for quality of class participation.
2. None of the students in the 'well above average' or 'above average' categories on the quantity dimension rated themselves 'below average' or 'well below average' in the quality dimension.
3. *Fifty-six* percent of the students considered the quantity of their participation to be above average or better, while *84* percent of the students felt that the quality of their participation was above average or better.
4. There appeared to be some crowding around the mean, more so in the quantitative dimension.

The class discussion that followed explored the reliability of self-ratings, particularly for areas in which output measurement is qualitative or subjective in nature. Possible reasons for the biases were examined and recommendations to minimize the biases were made. The above process required about 25 minutes. Later, while discussing the Hyatt Hill Health Care case, problems in evaluating costs (quantitative measure) and quality of patient care (qualitative measure) were examined in the light of the experiential exercise. These led to some student recommendations on the precautions to be taken while using self-ratings either in setting targets or evaluating performance of physicians during a bottom-up process such as

Management by Objectives. Students also discussed how compensation plans could influence physician behavior.

The performance evaluation role-play exercise was conducted at the beginning of the twelfth session using the steps outlined in Appendix B. The two student volunteers playing the roles got so involved in the exercise that it took them some time to reassume their student roles once the exercise was over. Each of them expressed frustration at the ambiguity of the situation which made it extremely difficult for them to reach an agreement. The remaining students in the class identified the differences in the assumptions made by the superior and the subordinate. The role of trust and clarity of communication in superior-subordinate relationships and problems in evaluating performance in areas where quantitative measures are absent were the major issues raised in the classroom. Students were then encouraged to share their own experiences in organizational settings. Several similarities between real-life experiences and the role-play exercise were identified and implications for managers were examined. The performance evaluation role-play exercise was then related to the self-evaluation exercise. This led to some generalizations on the role of a subordinate's perception of the performance evaluation process. The above process required about 35 minutes.

The experiential exercise helped the students to understand how either absence of or ambiguous performance targets could demotivate a subordinate. Further, it demonstrated that unless the superior used an appropriate management style during the performance evaluation process, dysfunctional consequences might result. Both the cases assigned for the day emphasized managerial style and evaluation of divisional or plant managers. Bondsville Manufacturing Company case showed that if a president got involved in the day-to-day decisions at the divisional level, it would be difficult to evaluate the true performance of the divisional managers. The Cummins Engine Company case demonstrated that in some situations budgetary targets should be used for educating managers rather than for evaluating them.

At the end of each session, the instructor summarized the class discussion by identifying the various concepts which came up during the class and integrated them into a theoretical framework. Students were then asked to review the assigned readings and identify areas in the theoretical framework which could not be reconciled with their observations during the experiential exercise. These were discussed at the beginning of the next class.

CONCLUDING REMARKS

It is important that the instructor be comfortable with the idea of using experiential learning techniques. Otherwise neither the instructor nor the students will consider the experience to be a beneficial one. Instructors with no experience in experiential education could learn the technique by observing or participating in such exercises. Instructors who feel that experiential learning techniques are threatening to either instructor or students should be allowed to use other pedagogies. In summary, though experiential learning exercises are suitable for teaching behavioral aspects of accounting, they should be used carefully and only by those instructors who are willing and qualified to use them.

Experiential learning devices could be used at either the graduate or undergraduate level. However, while using such exercises in an undergraduate class, the instructor should provide more guidance in conducting the class discussion and in drawing conclusions. Further, the conceptual content of the instructor's summary at the end of the exercise will be higher for graduate students. The instructor should take precautions to ensure that the exercise is treated as the means rather than an end and that relevant concepts and theoretical frameworks are inferred from the exercise.

These exercises could be used effectively to complement assigned readings, cases, and lectures in teaching behavioral aspects of accounting. The exercises generate considerable student involvement and participation in the learning process and students remember these experiential exercises for a long period of time [Coleman, 1976]. The experiential method may make the task of learning behavioral aspects of accounting more interesting to students. It is difficult to develop rigorous measures of the relative effectiveness of experiential learning. First, it was not feasible to teach the same topic to two sets of students using different approaches, since there was only one section. Second, Forrest, Knapp and Pendergrass [1976] point out that reliable assessment of experiential learning would require student dossiers, multiple assessors, frequent faculty-student contact, review panels of employers, and training workshops for students and assessors. Hence, subjective evaluation of effectiveness had to be adopted, even though objective measures would have been preferred.

In summary, the experiential learning approach is worth considering for adoption in courses which include behavioral concepts or frameworks and their implications for accounting. The two exercises described here may be helpful in teaching the topic of performance evaluation in either undergraduate or graduate-level courses. By developing and using similar experientially-based exercises for other behavioral accounting topics, the quality of learning in such courses could be enhanced significantly. The gap between accounting and behavioral sciences can be closed only if the use of similar non-traditional pedagogical approaches becomes more widespread.

APPENDIX A

SELF-EVALUATION:
AN EXPERIENTIAL EXERCISE

Goal: To expose students to a situation where performance evaluation is partly based on (a) objective data, and partly on (b) subjective data. A secondary objective of the exercise is to learn about problems encountered in using self-evaluation as an input to an MBO system.

Target Audience: Fifteen to 50 participants in a course which teaches, among other things, behavioral issues in performance evaluation. This exercise should be used only after at least one-third of the course has been completed.

Time Required: Approximately thirty minutes.

Materials: 3″ × 5″ index cards—one card per student.

Type of Room: Any type of classroom.

Issues/Topics Covered: Factors influencing self-rating of performance reported to superiors; self-control vs. organizational controls; problems in using subjective/objective data in performance evaluation; problems in using a bottom-up process for planning and control purposes.

Procedure:

Step 1: Distribute one index card to each student. Announce: "This is an experiential learning exercise dealing with performance evaluation. We need only aggregate information based on the exercise. Hence, do *not* write your name on the index card provided. Rate your performance in class participation so far in this course, along two dimensions: (1) Quantity and (2) Quality. Each of the two ratings should use the rating scale I will be writing on the blackboard. After you have rated yourself, turn the card and pass it to the first row. I will be collecting the cards after a few minutes."

Step 2: Write on the blackboard:

Rating Scale

(1) Well Above Average (WAA)
(2) Above Average (AA)
(3) Below Average (BA)
(4) Well Below Average (WBA)

Note: Only the above rating categories should be used. The term 'average' in the above rating scale refers to the average performance of students in *this* classroom. (It is recommended that instructors should not use the 'average' category in the above scale. When the 'average' category was used in a class, nearly 70 percent of the students rated themselves as 'average' in both quantity and quality, and it was not possible to draw any conclusions on the quality dimension.)

Step 3: Collect the cards from the first row. With the help of a student volunteer who reads the rating on each card, prepare a frequency chart using the following format. Ask the remaining students to (a) identify trends in the frequency chart and (b) to come up with explanations for the observed trends.

FREQUENCY CHART

		Quantity of Class Participation				
		Well Above Average	*Above Average*	*Below Average*	*Well below Average*	*TOTAL*
Quality of Class Participation	Well Above Average					
	Above Average					
	Below Average					
	Well Below Average					
	Total					

Step 4: Generate a class discussion based on trends identified by students and the related explanations. Help the students in identifying some behavioral issues, such as role of trust in target setting, managerial motivation, role ambiguity, and behavioral consequences of performance evaluation.

Step 5: Assign further readings for the next class. Offer a list of optional references for each major concept or framework discussed in the class.

Other Versions: If an instructor teaches two sections of the course, then he or she may prefer to administer the self-rating scale anonymously in one class (as described above). Students in the second section should be asked to put their names on the card before the exercise begins. The initial announcement in Step 1 should be modified accordingly. The aggregate data from the two classes should be compared and contrasted in both classes during the next class meeting. If this version is used, the instructor should announce how the student ratings will be used, at either the beginning or end of the session in which students were asked to write down their names. It may be preferable to announce it at the end of the class so that more reliable data will be collected.

APPENDIX B

PERFORMANCE EVALUATION: A ROLE-PLAY EXERCISE

Goal: To sensitize participants to some of the difficulties encountered in the performance evaluation process.

Group Size: Ten to 30 participants. The learning experience from the exercise would be enhanced if (a) some participants in the group have a strong interest in an accounting career and others have varied career interests, and (b) the group consisted of persons with prior experience in different hierarchical levels of organizations.

Time Required: Thirty to 45 minutes.

Materials: Instruction sheet for the superior and instruction sheet for the subordinate.

Type of Room: Any classroom, preferably of the amphitheater type or a room large enough for the group to observe the two persons playing the assigned roles.

Issues/Topics Covered: Role of trust in superior/subordinate relationships; impact of ambiguities associated with job roles; difficulties in giving/receiving feedback; problems in evaluating "service" departments such as personnel; and problems in using "control" systems constructively.

Procedure:

Step 1: Announce: "We need two volunteers for an experiential learning exercise dealing with performance evaluation." The volunteers should be chosen from those who raised their hands first.

Step 2: The instruction sheets for the superior and the subordinate should be assigned to the two volunteers randomly. We could use two unmarked envelopes containing the role descriptions and ask each volunteer to pick one envelope. The two volunteers should be asked to read their respective role descriptions outside the room without conferring with each other.

Step 3: The remaining members of the group should then be instructed to observe and note:

(a) The assumptions made by the superior;
(b) The assumptions made by the subordinate;
(c) The gaps in communication, if any; and
(d) The effectiveness of the performance evaluation process.

Step 4: Role-Play Exercise: Approximately ten minutes.

Step 5: The role players describe how they felt during the exercise.

Step 6: The remaining members of the group share their observations and feelings during the role-play exercise as well as how they would have acted if they had played the roles.

Step 7: The instructor leads a discussion of the learning from the exercise and establishes conceptual linkages.

Other Versions: This exercise could be carried out with four volunteers, such that for the first set of two volunteers the role descriptions suggest a high degree of trust in the relationship between the superior and the subordinate, while there is a lack of trust between the role players in the second set. All four volunteers will be asked to leave the room to read their instructions, and after some time the first set of two volunteers will then be asked to play their roles. Once this is over, the second set of volunteers will be asked to come in and play their roles. The remaining group members will be asked to focus on the differences they noticed between the two role-play exercises. Another possibility would be to choose one male and one female volunteer, to explore some problems encountered in professional male-female relationships.

Performance Evaluation: A Role-Play Exercise

Instruction Sheet for the Superior

You are the Head of Personnel in XYZ Company. Ms. A is your Employee Relations Manager. You know that she is reasonably good at her job. But you also know that she thinks herself to be "outstanding," which isn't true. She is scheduled to have a meeting with you in five minutes, and you would like to establish clearer communication with her and would like her to avoid having a grandiose image of herself.

You believe that she is on the right track, but it would take her about two years to reach the stage at which she can be promoted. As to her performance, you have received some good reports, as well as *three* letters of complaint. She had prepared four research reports which you considered to be above average—but to keep her motivated and happy you had told her that it was an excellent job. Maybe it was a mistake on your part.

You are also worried about the impact on other employees, whose performance is nearly as good, if Ms. A is promoted. So you plan to set meaningful targets for her this year and evaluate her performance one or two years from now and promote her if she deserves it.

Note: The above role description assumes that the person designated as "A" is a female, so that a simpler writing style could be adopted. However, "A" could be either a male or a female.

Performance Evaluation: A Role-Play Exercise

Instruction Sheet for the Subordinate

You are the Employee Relations Manager in XYZ Company. Mr. B is your boss and his title is Head of Personnel. You know that you are one of the best performers in your department and may be the best one. However, even though you expected to be promoted last year, you have not been promoted. So you would like to see yourself promoted this year.

However, you expect your boss to raise some obstacles to your promotion. He is bound to mention three letters of complaint against you, for instance. He seems to point out only your errors. Up front, you plan to remind him about the fact that you wrote four research reports which Mr. B himself said were *excellent.*

If he tries to delay your promotion unnecessarily, you plan to confront your manager. You think there have been many instances in which your performance was rated better than your colleagues in the department. You have decided that you will press for your point of view firmly, but also rationally, in a professional manner.

Note: The above role description assumes that the person designated as "B" is a male, so that a simpler writing style could be adopted. However, "B" could be either a male or a female.

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FINANCIAL REPORTING

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Bond Exchanges in the Airline Industry: Analyzing Public Disclosures

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ABSTRACT: A bond exchange is a transaction in which a corporation with an outstanding bond issue offers the current bondholders a new bond in exchange for the outstanding bonds. Bond exchanges affect firms by: (1) altering the cash payments to bondholders, (2) increasing reported earnings, (3) improving financial ratios such as debt/equity, and (4) affecting tax obligations. Although bond exchanges are fairly common, especially in the airline industry, these transactions may be difficult to analyze. This paper reviews the sequence of public disclosures involving an exchange offer, illustrates a present value method for evaluating bond exchanges, and compares the reported results with the "economic" results obtained from this method. Eastern Airlines' 1980 bond exchange is used for illustrative purposes.

SINCE the early 1970s, bond exchanges have been popular transactions for U. S. companies. Among other things, these exchanges enable a company to postpone the maturity date of its debt, increase reported income and retained earnings, reduce the book value of debt, and improve key financial ratios (e.g., debt/equity). A well-publicized example is Pan American World Airlines' bond exchange in 1976. By issuing two new bonds in exchange for two outstanding bond issues, Pan Am recognized an extraordinary, pretax gain of $117.5 million, extended its maturity date by ten years, and lowered its debt/equity ratio by 33 percent. This transaction has been cited in an accounting textbook because it shows how dramatically a bond exchange can affect a company's financial statements and financial ratios. (See Davidson, Stickney, and Weil [1982, para. 17.67]).

Bond exchanges have been especially attractive for companies that issued bonds in the 1960s when stated interest rates were considerably below the rates of the late 1970s and early 1980s, and for companies with available investment tax credits (ITC) or tax loss carry-forwards.

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It is not surprising, therefore, that bond exchanges have frequently occurred in the airline industry. Between 1976 and 1980, Pan American, Allegheny (now USAir), UAL Inc. (United), Eastern, and Trans World Corp. (TWA) all performed bond exchanges. In each case, the refunding firm reported a substantial gain.

Primarily due to the large balance sheet and income statement effects of a bond exchange, the popular press has been critical of the accounting treatment accorded these transactions. For example, in an article titled "Paper Money," *Forbes* [1975] stated: "It seems a mockery to have profit statements—which most investors think reflect the company's health—embellished with 'profits' from paper shuffling." This view suggests that the reported gain is either illusory (i.e., the present value of the cash outflows on the new bonds equals or exceeds that of the old bonds) or should have been recognized as interest rates changed (i.e., current value accounting). Given sufficient disclosure, however, an analyst can assess whether the accounting treatment reflects the economic effects of the transaction.

It is often difficult to analyze the impact of bond exchanges because their effects are not disclosed in any one place. Instead, it is necessary to examine several documents, such as the prospectus for the new bond and the subsequent quarterly and annual financial statements, including their footnotes. This process requires careful analysis because of the complexity of the various disclosures. *Forbes* [1973, p. 42] criticized the complexity of one firm's prospectus as containing "dense verbiage" of a "fiscal fairy tale." However, *Forbes* did acknowledge that a thorough analysis of the "repellent legalese" can produce revealing insights.

Given the popularity of bond exchanges, their dramatic effects on financial variables, and the alleged difficulty of analyzing an exchange offer, the purpose of this article is fourfold: (1) to review the usual sequence of events in an exchange offer; (2) to determine whether public disclosures in the press, prospectus, and other financial reports are generally sufficient to permit an economic analysis of a bond exchange; (3) to demonstrate a technique for analyzing the present value of a bond exchange; and (4) to examine the sensitivity of the analysis to assumptions about depreciation and future tax and discount rates. Eastern Airlines' 1980 bond exchange is used as an illustration because it is representative of most exchanges in the airline industry.

A BOND EXCHANGE AND RELATED DISCLOSURES

On August 15, 1980, Eastern Airlines announced plans to issue $575 principal amount of new 11-3/4 percent convertible subordinated debentures, due 2005 (new bonds), in exchange for each $1000 principal amount of its outstanding 4-3/4 percent convertible subordinated debentures, due 1993, and five percent convertible subordinated debentures, due 1992 (old bonds). The announcement in *The Wall Street Journal* gave no explanation for the exchange. Eastern filed a prospectus describing the proposed exchange with the Securities and Exchange Commission on September 4, 1980. The following day, *The Wall Street Journal* summarized the offer. The prospectus was dated September 19, and became effective on September 23.

The prospectus provided detailed information about the exchange offer, the purpose of the offer, and pro forma effects of the exchange. Exhibit 1 (p. 123), which is taken directly from Eastern's prospectus, contains a "comparison of certain principal features" of the new bond and old bonds. According to this information, Eastern would reduce the face amount of its outstanding debt, but its annual interest payments would increase from $47.50 ($50 for the five percent bond) to $67.56 per bond. This exhibit also reveals two other important features that would be altered by the exchange. First, the maturity date of Eastern's debt is extended by 12 and 13 years. That is, the old bonds are scheduled to mature in 1992 and 1993, while the new bonds mature in 2005. Second, there are different sinking fund obligations between the old and new bonds. In particular, sinking fund payments on the new bonds commence in 1991 while both old bonds *currently* require sinking fund payments. Reacquired bonds can be used to satisfy sinking fund obligations for both the 4-3/4 percent and the five percent bonds. Consequently, the exchange would effectively delay Eastern's sinking fund obligations.

Eastern's prospectus [Eastern Airlines, Inc., 1980, p. 4] also presented four major reasons for the exchange offer:

(1) to reduce the principal amount and extend the maturity of Eastern's debt represented by the Old Debentures;
(2) to postpone the date of further sinking fund payments and reduce the amount of sinking fund payments on such debt;
(3) to enhance the potential for conversion of such debt into equity, and
(4) to record the New Debentures at their fair value on Eastern's financial statements, thereby recognizing a substantial extraordinary gain, reducing debt, and increasing retained earnings.

Each reason is described in greater detail in another section of the prospectus. Additionally, pro forma balance sheet and income statement information is given. Eastern based its pro forma data, which are presented in Exhibit 2 (p. 124), on assumed 50 percent and 100 percent acceptance rates.

The exchange period began on the effective date of the prospectus. During the exchange period, many investors tendered their old bonds to the exchange agent. Although the termination date of the exchange period was set in the prospectus, Eastern extended the exchange period twice by filing amendments to the prospectus with the Securities and Exchange Commission. The final termination date was October 31, 1980.

After the exchange period expired, Eastern issued a press release describing the results of the exchange. As reported in *The Wall Street Journal* on November 10, 1980, $30.2 million of Eastern's 4¾ percent debentures and $30.6 million of its five percent debentures were exchanged. Based on the news release and the prospectus, an analyst has sufficient information to project the effects of the exchange on the company's balance sheet and income statement.

The actual income statement effects were revealed in Eastern's next earnings announcement. Its earnings for the 1980 fourth quarter, as reported in *The Wall Street Journal* on January 28, 1981, contained an extraordinary gain of $24.7 million for both the quarter and the year. More detailed information was reported later in Eastern's 1980 annual report. Exhibits 3, 4, and 5 (pp. 125 and 126) show condensed information about Eastern's long-term debt, income and retained earnings, and statement of changes in financial position, respectively, as it appeared in the annual report.

The exchange's balance sheet effects were indirectly disclosed in a footnote describing Eastern's long-term debt. The footnote (Exhibit 3) clearly shows that the balances for the old bonds have been reduced and that new debt has been issued. From this information, the effects of the exchange on selected financial ratios, such as the debt/equity ratio, can be estimated. However, other transactions during the year may have affected the long-term debt balances. To separate the exchange's effect from the impact of other transactions, the statement of changes in financial position (shown as Exhibit 5) provides relevant information. After examining the data in Exhibits 4 and 5, the exchange entry can be reconstructed as:

Dr: 4¾ percent and 5 percent Convertible Subordinated Debenture (Exhibit 5)	$60,891	
Dr: Discount on 11¾ percent Debenture (Exhibit 5)	2,451	
Cr: 11¾ percent Convertible Subordinated Debenture (Exhibit 5: $32,561 + $2,451)		$35,012
Cr: Pretax gain on exchange (Exhibit 4: $24,654 + 2,498)		27,152
Cr: Plug (presumably Cash for related expenses)		1,178
Dr: Provision for tax on exchange gain (Exhibit 4)	2,498	
Cr: Deferred Tax		2,498

This journal entry shows that the book value of Eastern's long-term debt was decreased by $28.330 million [$60.891 − ($35.012 − $2.451)] as a result of the exchange. Shareholders' equity was increased by $24.654 million, after taxes. The plug amount of $1.178 million is assumed to represent cash payments for expenses and the purchase of fractional bonds.[1] Reported liabilities at December 31, 1980, were $2,241.379 million, and shareholders' equity was $574.798 million. Thus, the reported debt/equity ratio at year-end was 3.9. Had the exchange *not* taken place, liabilities would have been $2,269.709 million while shareholders' equity would have been $550.144 million. The resulting debt/equity ratio would have been 4.13. In other words, Eastern's debt/equity ratio decreased by 5.6 percent as a result of the exchange.

The income statement effects of the exchange are shown in Exhibit 4. Eastern reported an extraordinary gain of $24.654 million, net of deferred taxes of $2.498 million. The income statement refers to a footnote (Note B) that describes the exchange:

> During the fourth quarter of 1980, the Company completed an offer to exchange $575 principal amount of a new issue of 11¾ percent Convertible Subordinated Debentures due November 1, 2005 for each $1,000 principal amount of its 4¾% and 5 percent Convertible Subordinated Debentures. As a result of the offer, $35 million principal amount of 11¾ percent Debentures were issued in exchange for $30.2 million and $30.7 million principal amounts of 4¾ percent and 5 percent Convertible Subordinated Debentures respectively. The 11¾ percent debentures were recorded at their approximate fair market value at the time of the exchange. The debenture exchange resulted in an extra-

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[1] The detail provided in Eastern's financial statements is insufficient to permit a complete reconstruction of the actual journal entry. According to the prospectus, Eastern projected its cash expenses associated with the exchange to be $1.3 million. To determine the exact amount of the cash expenditure, we contacted Eastern Airlines. The actual amount was $864,000. The difference between the "plug" amount of $1,178,000 and the actual cash expenditure was a reduction in the unamortized discount on old bonds, amounting to $314,000. The financial statements do not show the credit to the discount on old bonds, probably because the amount is immaterial.

ordinary gain of $24.7 million (99 cents per share).

In summary, it is possible to untangle an exchange transaction and reconstruct the journal entry by carefully reviewing a company's prospectus and subsequent financial statements. For Eastern, the statements report increased net income, reduced book value of debt, and an improved debt/equity ratio. The actual economic effect of the exchange can be analyzed by estimating the cash flow changes. We describe this approach in the next section.

BOND EXCHANGES AND CASH FLOW EFFECTS

Bonds usually affect the cash flows of a corporation in three ways: (1) interest payments, (2) sinking fund or principal payments, and (3) tax consequences. The annual interest payments depend upon the contractual interest rate and the face amount of the outstanding debt. In addition to paying interest, bonds often require a corporation to provide a sinking fund. Sinking fund obligations typically require a corporation to deposit cash with a bond trustee each year. In some cases, sinking fund obligations may be met by depositing bonds that have been repurchased in the market. If the bonds are repurchased at less than book value, a taxable gain is recognized. Either way, a corporation may be obligated to make cash payments for sinking fund purposes. Finally, bonds affect tax payments because interest expense reduces taxable income.

Bond exchanges may affect tax payments in another way. If the book value of the old bonds is greater than the face amount of the new bonds, cancellation of indebtedness income is created.[2] The resulting gain is taxable immediately unless the corporation meets one of three criteria:[3] (1) it is insolvent, (2) it is a subchapter *S* corporation, or (3) it elects to reduce the tax basis of the asset purchased with the proceeds of the old bonds.[4] If the company chooses to reduce the basis of an asset, the gain is implicitly recognized as the asset is depreciated or when it is sold.[5]

The cash flow effects of Eastern's bond exchange are projected in Tables 1 and 2. Table 1 presents the estimated cash flows on the 4¾ percent and five percent bonds, assuming that the bond exchange did *not* occur. The table shows the three components that affect cash flow: (1) interest payments, (2) sinking fund payments (and principal payment[6]), and (3) tax payments or savings. The assumptions and calculations underlying this table are discussed next.

The face amount of debt outstanding each year is shown in columns 2 and 3. These amounts are adjusted annually for Eastern's sinking fund requirements as described in the prospectus (see Exhibit 1, p. 123). The annual interest payment is the product of each bond's stated rate and the face value of debt outstanding. Interest payments are tax-deductible; the resulting tax savings are shown in column 6.

In computing the tax savings, Eastern's effective tax rate in future years is assumed to be the 1980 statutory tax rate, 46.0 percent, with adjustments for reported ITCs. At the time of the

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[2] Federal Tax Regulation 1.61-12(c)(3)

[3] See Chirelstein and Suwalsky [1976, p. A-12-16(1)].

[4] Internal Revenue Code section 108 and Regulation 1.1017-1.

[5] If the book value of the old bonds is less than the face amount of the new bonds, the corporation can deduct the excess principal amount as "retirement premium." However, the firm cannot deduct any portion of the retirement premium arising from a conversion feature on the old bond. Instead, the deduction for the retirement is limited to a normal call premium for nonconvertible debt.

[6] Principal payments are shown with sinking fund payments because their effects are similar; both reduce outstanding debt.

TABLE 1

EASTERN AIRLINES INC. PROJECTED CASH FLOWS FOR BONDS ASSUMING BOND EXCHANGE DID NOT OCCUR (IN $ MILLIONS EXCEPT AS NOTED)

		Face Amount of Debt Outstanding		*Interest Payment*		
Year	*Effective Tax Rate (percent) (1)*	*4¾% Bond (2)*	*5% Bond (3)*	*4¾% Bond (4)*	*5% Bond (5)*	*Tax Savings (6)*
1981	9.2	43.00	61.00	2.04	3.05	.47
1982	4.6	40.65	57.50	1.93	2.88	.22
1983	4.6	38.30	54.00	1.82	2.70	.21
1984	4.6	35.95	50.50	1.71	2.53	.19
1985	4.6	33.60	47.00	1.60	2.35	.18
1986	4.6	31.25	43.50	1.48	2.18	.17
1987	4.6	28.90	40.00	1.37	2.00	.16
1988	46.0	26.55	36.50	1.26	1.83	1.42
1989	46.0	24.20	33.00	1.15	1.65	1.29
1990	46.0	21.85	29.50	1.04	1.48	1.16
1991	46.0	19.50	26.00	.93	1.30	1.02
1992	46.0	17.15	22.50	.81	1.13	.89
1993	46.0	14.80	—	.70	—	.32

	Sinking Fund Face Amount		*Estimated Market Price (% of face)*		*Payments for Sinking Fund*				
Year	*4¾% Bond (7)*	*5% Bond (8)*	*4¾% Bond (9)*	*5% Bond (10)*	*4¾% Bond (11)*	*5% Bond (12)*	*Aggregate Gain on Repurchase (13)*	*Tax on Gain (14)*	*Total Cash Flow (15)*
1981	2.35	3.50	.516	.529	1.21	1.85	2.79	.26	7.94
1982	2.35	3.50	.535	.550	1.26	1.93	2.67	.12	7.89
1983	2.35	3.50	.557	.574	1.31	2.01	2.53	.12	7.75
1984	2.35	3.50	.581	.601	1.37	2.10	2.38	.11	7.62
1985	2.35	3.50	.608	.632	1.43	2.21	2.21	.10	7.51
1986	2.35	3.50	.639	.667	1.50	2.33	2.01	.09	7.42
1987	2.35	3.50	.674	.706	1.58	2.47	1.80	.08	7.36
1988	2.35	3.50	.713	.751	1.68	2.63	1.55	.71	6.68
1989	2.35	3.50	.758	.802	1.78	2.81	1.26	.58	6.68
1990	2.35	3.50	.808	.860	1.90	3.01	.94	.43	6.70
1991	2.35	3.50	.864	.926	2.03	3.24	.58	.27	6.74
1992	2.35	22.50	.928	1.000	2.18	22.50	.17	.08	25.81
1993	14.80	—	1.000	—	14.80	—	.00	.00	15.18

Calculations:

(2),(3)—see text

(4) = .0475 × (2)

(5) = .05 × (3)

(6) = (1) × [(4) + (5)]

(7),(8)—from *Moody's Transportation Manual*

(9),(10)—see text

(11) = (7) × (9)

(12) = (8) × (10)

(13) = [(7) + (8)] − [(11) + (12)]

(14) = (1) × (13)

(15) = (4) + (5) − (6) + (11) + (12) + (14)

TABLE 2

EASTERN AIRLINES INC. PROJECTED CASH FLOWS FOR BONDS AFTER BOND EXCHANGE
(IN $ MILLIONS EXCEPT AS NOTED)

		Face Amount of Debt Outstanding			*Interest Payment*			*Amortization of Discount*	
Year	*Effective Tax Rate (percent) (1)*	*4¾% Bond (2)*	*5% Bond (3)*	*11¼% Bond (4)*	*4¾% Bond (5)*	*5% Bond (6)*	*11¼% Bond (7)*	*11¼% Bond (8)*	*Tax Savings (9)*
1981	9.2	12.80	30.30	35.00	.61	1.52	4.11	.10	.58
1982	4.6	12.80	30.30	35.00	.61	1.52	4.11	.10	.29
1983	4.6	12.80	30.30	35.00	.61	1.52	4.11	.10	.29
1984	4.6	12.80	30.30	35.00	.61	1.52	4.11	.10	.29
1985	4.6	12.80	30.30	35.00	.61	1.52	4.11	.09	.29
1986	4.6	12.80	30.30	35.00	.61	1.52	4.11	.10	.29
1987	4.6	12.80	30.30	35.00	.61	1.52	4.11	.10	.29
1988	46.0	12.80	30.30	35.00	.61	1.52	4.11	.10	2.91
1989	46.0	12.80	30.30	35.00	.61	1.52	4.11	.10	2.91
1990	46.0	12.80	29.50	35.00	.61	1.48	4.11	.09	2.89
1991	46.0	12.80	26.00	35.00	.61	1.30	4.11	.10	2.82
1992	46.0	12.80	22.50	33.95	.61	1.13	3.99	.10	2.68
1993	46.0	12.80	—	32.90	.61	—	3.87	.10	2.10
1994	46.0			31.85			3.74	.10	1.77
1995	46.0			30.80			3.62	.09	1.71
1996	46.0			29.75			3.50	.10	1.65
1997	46.0			28.70			3.37	.10	1.60
1998	46.0			27.65			3.25	.10	1.54
1999	46.0			25.90			3.04	.10	1.45
2000	46.0			24.15			2.84	.09	1.35
2001	46.0			22.40			2.63	.10	1.26
2002	46.0			20.65			2.43	.10	1.16
2003	46.0			18.90			2.22	.10	1.07
2004	46.0			17.15			2.02	.10	.97
2005	46.0			15.40			1.81	.09	.87

exchange offer, ITCs could be used to offset 80 percent of a firm's tax liability in 1981 and 90 percent in future years. According to the prospectus, Eastern's available ITCs expire in 1987. We initially assumed that Eastern's investment tax credits would be available through 1987, after which Eastern would face the statutory tax rate. We investigate the impact of alternative tax rate estimates below.

Annual cash outflows for sinking fund and principal repayment are reported in columns 7 through 14. Columns 7 and 8 show the face amount of debt due annually for sinking fund or principal payments. For sinking fund purposes, Eastern can repurchase bonds from the market, rather than depositing cash with the trustee. Because market interest rates have increased since the bonds were issued, Eastern's bonds were selling at large discounts. We assumed the repurchase option would be exercised because it is less costly than depositing the face amount with the trustee. Columns 9 and 10 contain projected market prices for the old bonds, based

TABLE 2 *(Continued)*

EASTERN AIRLINES INC. PROJECTED CASH FLOWS FOR BONDS AFTER BOND EXCHANGE (IN $ MILLIONS EXCEPT AS NOTED)

	Sinking Fund Face Amount			*Payments for Sinking Fund*			*Purchase for Sinking Fund*			
Year	*4¾% Bond (10)*	*5% Bond (11)*	*11¾% Bond (12)*	*4¾% Bond (13)*	*5% Bond (14)*	*11¾% Bond (15)*	*Gain (16)*	*Tax (17)*	*Tax on Reduced Basis (18)*	*Total Cash Flow (19)*
1981	—	—	—	—	—	—	—	—	.36	6.01
1982	—	—	—	—	—	—	—	—	.18	6.12
1983	—	—	—	—	—	—	—	—	.18	6.12
1984	—	—	—	—	—	—	—	—	.18	6.12
1985	—	—	—	—	—	—	—	—	.18	6.12
1986	—	—	—	—	—	—	—	—	.18	6.12
1987	—	—	—	—	—	—	—	—	.18	6.12
1988	—	—	—	—	—	—	—	—		3.32
1989	—	.80	—	—	.64	—	.16	.07		4.04
1990	—	3.50	—	—	3.01	—	.49	.23		6.54
1991	—	3.50	1.05	—	3.24	1.05	.26	.12		7.62
1992	—	22.50	1.05	—	22.50	1.05	.00	.00		26.59
1993	12.80		1.05	12.80		1.05	.00	.00		16.22
1994			1.05			1.05	.00	.00		3.02
1995			1.05			1.05	.00	.00		2.96
1996			1.05			1.05	.00	.00		2.89
1997			1.05			1.05	.00	.00		2.83
1998			1.75			1.75	.00	.00		3.46
1999			1.75			1.75	.00	.00		3.35
2000			1.75			1.75	.00	.00		3.24
2001			1.75			1.75	.00	.00		3.13
2002			1.75			1.75	.00	.00		3.01
2003			1.75			1.75	.00	.00		2.90
2004			1.75			1.75	.00	.00		2.79
2005			15.40			15.40	.00	.00		16.34

Calculations:

(2),(3),(4)—see text
(5) = .0475 × (2)
(6) = .05 × (3)
(7) = .1175 × (4)
(8) = straight line amortization of $2.451 million over 25 years
(9) = (1) × [(5) + (6) + (7) + (8)]
(13),(14),(15)—see text
(16) = (11) − (14)
(17) = (16) × (1)
(18)—see text
(19) = (5) + (6) + (7) − (9) + (13) + (14) + (15) + (17) + (18)

on the bond's yield rate. Immediately before the announcement of the exchange, the bonds were selling for $500 (4¾ percent bond) and $510 (five percent bond), or a yield of 12.9 percent and 13.4 percent, respectively. These yield rates were used to project future market prices for these bonds.[7] Cash payments for bond repurchases are shown in columns 11 and 12. The difference between the projected cash payments and the face amount of repurchased bonds is a taxable gain (column 13). The estimated tax on the gain appears in column 14.

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[7] The estimated market price for each year was calculated by discounting the (remaining) coupon payments and the principal payment at the specified yield rate. For example, the 1981 market price of the 4¾ percent bond is estimated as the present value of an annuity of $47.50 per year for 12 years, discounted at 12.9 percent, plus the present value of $1000 to be paid in 12 years.

The final column in Table 1 shows the estimated total cash outflows, assuming that the refunding did *not* occur. The total cash outflow is the sum of the interest payments (columns 4 and 5), the sinking fund and principal payments (columns 11 and 12), and the tax on the gain (column 14), less the tax savings due to interest payments (column 6).

Table 2 repeats this process for Eastern's bonds after the exchange. Interest payments are calculated as in Table 1. The 11¾ percent bonds were issued at a discount; the discount is assumed to be amortized on a straight-line basis. The annual tax savings (column 9) is computed from the interest payments (columns 5, 6, and 7), the discount amortization (column 8), and the estimated effective tax rate (column 1). Eastern's sinking fund and principal payments are projected in columns 10 through 17 using information from Exhibit 1. Eastern was able to postpone sinking fund payments on its remaining old bonds until 1989, because enough old bonds were reacquired in the exchange to satisfy sinking fund obligations through 1988. In computing sinking fund payments, we used the estimated market prices shown in Table 1 for the old bonds; the 11¾ percent bonds are assumed to be repurchased at their face amounts.

Because of the exchange, Eastern recognized cancellation of indebtedness income; however, the company did not disclose its tax treatment of the gain in its 1980 annual report or 10-K. But the prospectus indicated that Eastern planned to reduce the tax basis of assets purchased with the proceeds from the old bonds. The prospectus [Eastern Airlines, Inc., 1980, p. 13] stated:

> Pursuant to Section 108 of the Internal Revenue Code, Eastern may elect to exclude such amount from income and instead reduce the tax basis of certain assets by such amount thereby increasing the gain or decreasing the loss realized on subsequent disposition of those assets and, in the case of assets subject to allowance for depreciation, reducing future depreciation deductions.

Moody's *Transportation Manual* reported that the proceeds from the old bonds were used to purchase flight equipment with lifetimes of 14 to 15 years and other equipment with lifetimes of four to 20 years. Because the old bonds were issued in 1968 and 1967, the purchased equipment will be fully depreciated in 1987 or 1988. We assumed that Eastern reduced the tax basis of its depreciable assets by the amount of the gain, and that the reduced depreciation is recognized on a straight-line basis through 1987 ($27.152 million spread over seven years in $3.88 million per year).[8] The estimate of the reduced depreciation tax effect is shown in column 18.

Column 19 shows the annual cash flow effects of the bonds after the exchange. The net cash flow is the sum of the interest payments (columns 5, 6, and 7), payments for sinking fund and principal (columns 13, 14, and 15), taxes arising from bond repurchases (column 17), and depreciation adjustments (column 18), less the tax savings due to interest expense (column 9).

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[8] Eastern's financial statements provide no direct indication of the validity of this assumption. A representative of Eastern Airlines informed us that the actual tax treatment was to reduce the basis of *all* of Eastern's depreciable assets by the amount of the gain. The assets were then depreciated on an accelerated basis using a 9.5-year life.

Comparing column 15 of Table 1 with column 19 of Table 2, it can be seen that Eastern reduced its cash outflows in the early years after the exchange. For example, the 1981 cash outflows decreased from $7.94 million to $6.01 million. After 1990, however, the cash outflows are higher, and the higher payments now continue until 2005, rather than 1993. As Tables 1 and 2 suggest, there is a considerable change in the amount and timing of Eastern's cash outflows because of the exchange.

ACCOUNTING GAIN VS. ECONOMIC GAIN

The analysis in the previous section provides insights into the cash flow effects of the exchange. However, the question of the economic benefits of the exchange to the firm (and its shareholders) was not addressed. In this section, the economic benefits, as measured by the present value of the cash flows, are compared to the gain reported for financial reporting purposes. In discussing "economic" gain, we focus on the cash flow effects of an exchange. Contracting effects such as the relaxation of bond covenants because of altered financial ratios or increased management compensation are discussed only briefly.

The "economic" gain or loss arising from an exchange can be computed as the difference between the present value of the projected net cash flows before and after the exchange.[9] In order to calculate present values, however, a discount rate must be selected. Selection of any single discount rate is arbitrary; we chose to use after-tax discount rates ranging from two to 30 percent. In Figure 1, Eastern's "economic" gain is plotted as a function of discount rate. For discount rates lower than eight percent, the "economic" gain is negative. That is, Eastern is worse off after the exchange in present value terms if its discount rate is eight percent or less. If Eastern's discount rate is greater than eight percent, then it appears to benefit from the exchange. For example, if Eastern's discount rate is 20 percent, its "economic" gain is estimated to be $4.26 million. Further increases in the discount rate, however, decrease the estimated benefit. So, for a range of discount rates, Eastern appears to benefit by the exchange, but not by the reported $24.7 million.

In calculating Eastern's "economic" gain, the cash flows projected in Tables 1 and 2 are assumed to approximate future cash outflows. Annual interest and sinking fund payments are well specified by the bond indenture. But projected tax payments and tax savings depend on Eastern's marginal tax rates in future years. Four different tax assumptions were used to test the sensitivity of the "economic" gain to alternative tax rates: (1) Eastern would generate ITCs indefinitely, (2) Eastern would operate at a loss so that its effective tax rate would be zero percent indefinitely, (3) ITCs would be available until 1987 with a 46 percent tax rate thereafter (i.e., as previously discussed), and (4) earnings would utilize all available ITCs so the marginal tax rate would be 46 percent each year. Figure 2 depicts Eastern's "economic" gain under each assumption. The figure shows that, although the "economic" gain is affected by tax rate assumptions, these alternative specifications appear to provide the same qualitative results.

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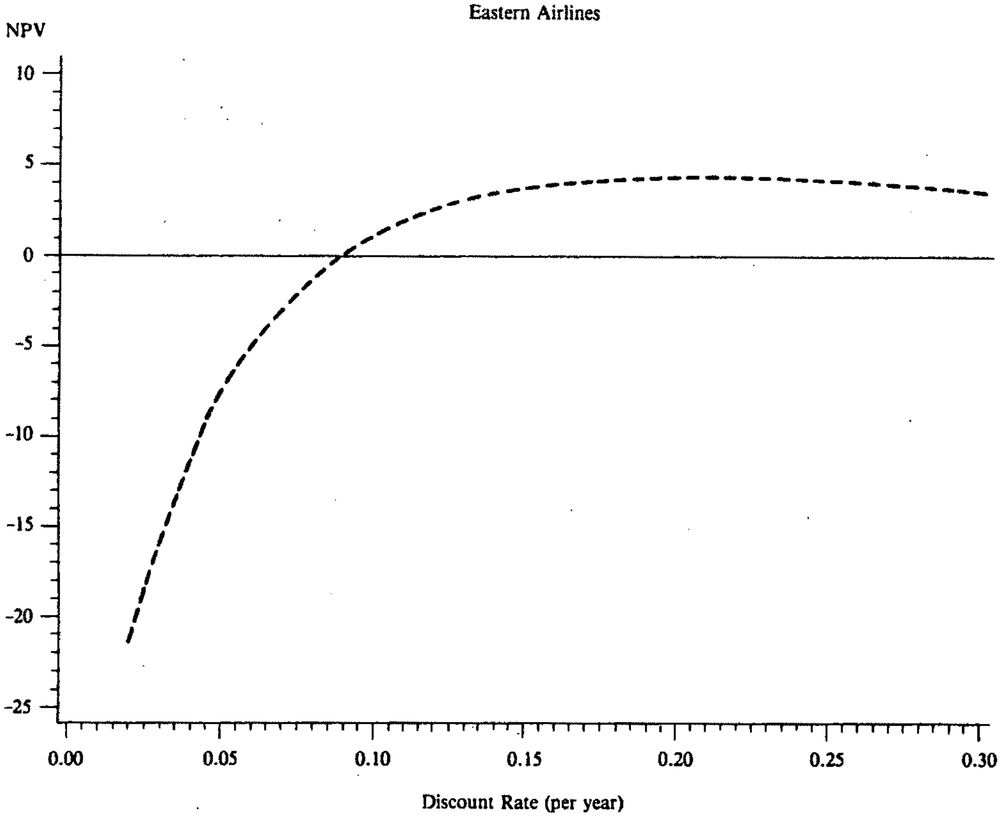
[9] Column 15 of Table 1 and column 19 of Table 2 show the estimated cash flows before and after the exchange, respectively. In addition, the "plug" amount of $1,178,000 from the reconstructed journal entry is assumed to be a cash outflow at the time of the exchange.

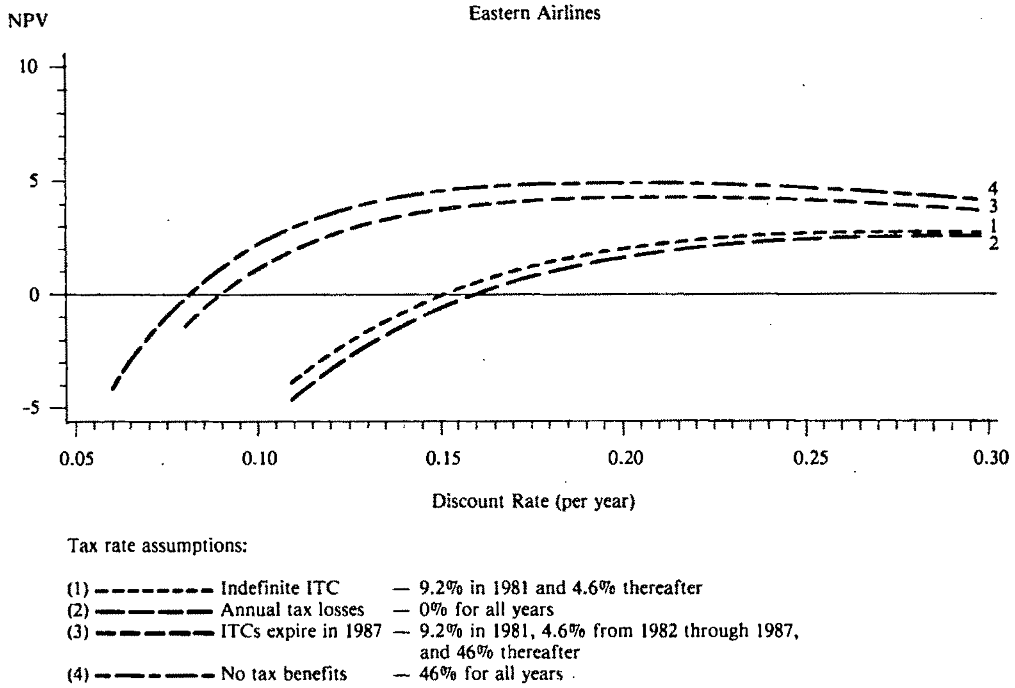
FIGURE 1
PRESENT VALUE OF EASTERN'S BOND EXCHANGE



Eastern does not reveal details about the tax treatment of the bond exchange in its financial report. Based on its prospectus (as discussed in the third section of this paper), it appears that Eastern reduced the basis of its assets by the amount of the gain. In the above analysis, we assumed that Eastern used a straight-line depreciation over seven years. We investigated the sensitivity of our results to various depreciation-method assumptions. We tested straight-line depreciation over one year (i.e., immediate recognition of gain) and over four years. Further, we tested sum-of-the-years'-digits depreciation over four years, seven years, and ten years (which approximates Eastern's actual treatment). The results are qualitatively different from those shown in Figure 1 only if Eastern's tax rate is assumed to be 46 percent throughout the period 1981-2005.

Although Eastern appears to have benefitted economically from the exchange, the *magnitude* of the benefit is substantially smaller than the gain reported on its financial statements. Eastern's financial statement showed a $24.65 million gain, net of tax. Two other airlines reported similar exchange gains in 1980. TWA reported a gain of

FIGURE 2
PRESENT VALUE OF EASTERN'S BOND EXCHANGE
USING ALTERNATIVE TAX RATES



$47.1 million. American's gain was $48.4 million. Figures 3 and 4 show the "economic" gain for TWA and American, respectively, across a variety of discount rates. As with Eastern, these airlines received "economic" gains of approximately $5 million if they use investment tax credits until 1987 and face the statutory rate thereafter.[10] Still, their "economic" benefits appear to be substantially smaller than the gains reported on their financial statements.

While an analyst can estimate cash flow changes from a bond exchange using public disclosures, the results reported under GAAP have wide-reaching implications. Because a bond exchange affects a firm's reported income, liabilities, and owners' equity, contracts based on these measures are affected. Bond covenants that utilize a "dividend pool" or debt/equity measure are relaxed because of an exchange. Management compensation based on reported net income may be affected as well. There is recent evidence that stock prices may be affected by the exchange gain. Dietrich [1984] examined 36 firms that exchanged debt between 1970 and 1980. Thirty-four of these firms reported increased earnings because of the exchange. For the 36 firms taken as a group, there appears to be a positive, significant, unexpected

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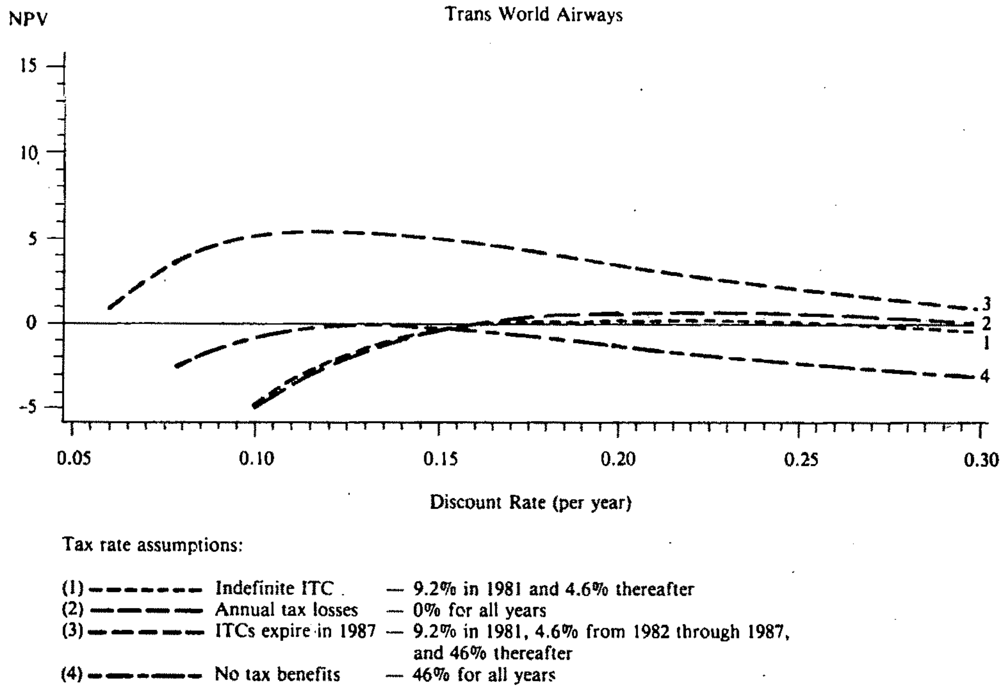
[10] American has $88.0 million in unused investment tax credits as of December 31, 1980. TWA's unused tax credits are $100.3 million.

FIGURE 3
PRESENT VALUE OF TRANS WORLD'S BOND EXCHANGE
USING ALTERNATIVE TAX RATES



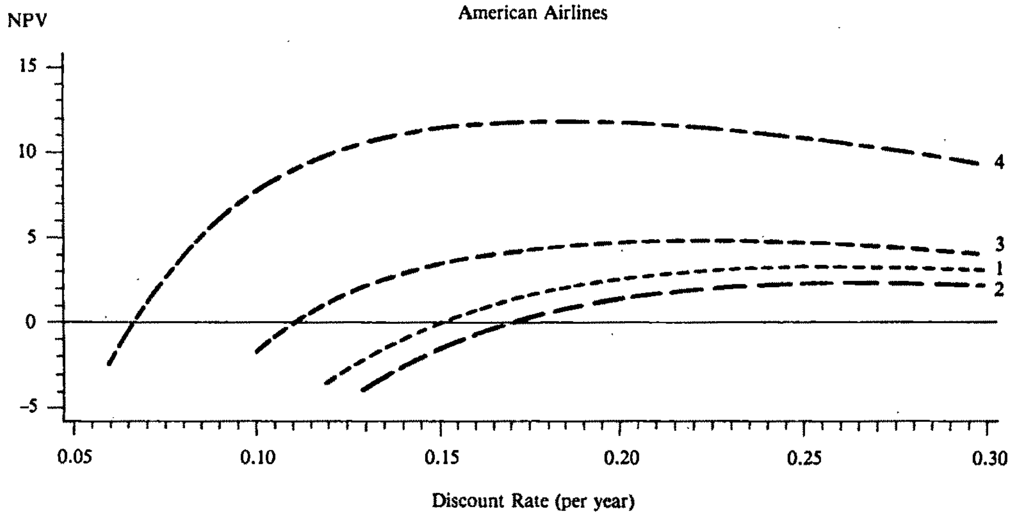
stock return around the time of the quarterly earnings report. While the stock market reaction cannot be attributed to the exchange gain, there appears to be some evidence that the market's reaction is associated with the earnings report. Consequently, it is important for decision makers to evaluate both the economic and reported results of a bond exchange.

SUMMARY

Bond exchanges affect a refunding corporation's cash flow in several ways. Interest payments, sinking fund payments, and principal repayments often change. Tax payments are altered through interest expense deductions and the exchange gain, which may be reflected in adjusted depreciation charges. Using Eastern Airlines' 1980 bond exchange, we have shown how Eastern's public disclosures can be used to project cash flow changes resulting from an exchange. Based upon these projections, the exchange has a positive net present value for some discount rates, but not for others. Corresponding analysis for American Airlines and Trans World Airlines reveals similar results. Although the disclosures do not identify completely all of the cash flow changes resulting from a bond exchange, the estimated economic gain is qualitatively unchanged by alternative assumptions concerning future tax rates and depreciation methods.

FIGURE 4

PRESENT VALUE OF AMERICAN'S BOND EXCHANGE USING ALTERNATIVE TAX RATES



Tax rate assumptions:

(1) - - - - - - - - Indefinite ITC — 9.2% in 1981 and 4.6% thereafter
(2) — — — — — Annual tax losses — 0% for all years
(3) — — — — — — ITCs expire in 1987 — 9.2% in 1981, 4.6% from 1982 through 1987, and 46% thereafter
(4) — — — — — No tax benefits — 46% for all years

EXHIBIT 1

COMPARISON OF NEW DEBENTURES AND OLD DEBENTURES OF EASTERN AIRLINES (TAKEN FROM ITS PROSPECTUS DATED SEPTEMBER 19, 1980)

	Old Debentures	
New Debentures	*4¾ Percent Debentures*	*Five Percent Debentures*
Exchange Ratio: $575 principal amount of New Debentures.	For each $1,000 principal amount of 4¾ percent Debentures.	For each $1,000 principal amount of 5 percent Debentures.
Annual Interest: $67.56 per $575 principal amount payable semi-annually on May 1 and November 1, commencing May 1, 1981.	$47.50 per $1,000 principal amount payable semi-annually on April 1 and October 1.	$50 per $1,000 principal amount payable semi-annually on May 1 and November 1.
Convertibility: Convertible at any time on or prior to maturity at a ratio of approximately 44.23 shares of Common Stock for each $575 principal amount of New Debentures (or a conversion price of $13 per share).	Convertible at any time on or prior to maturity at a ratio of approximately 29.41 shares of Common Stock for each $1,000 principal amount of 4¾ percent Debentures (or a conversion price of $34 per share).	Convertible at any time on or prior to maturity at a ratio of approximately 20.00 shares of Common Stock for each $1,000 principal amount of 5 percent Debentures (or a conversion price of $50 per share).
Maturity: November 1, 2005.	October 1, 1993.	November 1, 1992.
Sinking Fund: Annual sinking fund payments, beginning November 1, 1991, of 3 percent to and including November 1, 1997 and thereafter of 5 percent of the principal amount of New Debentures originally issued pursuant to the Exchange Offer, calculated to retire 56 percent of such principal prior to maturity.	Annual sinking fund payments, beginning October 1, 1979, of 4.7 percent of the principal amount of 4¾ percent Debentures originally issued, calculated to retire approximately 66 percent of such principal amount prior to maturity.	Annual sinking fund payments, beginning November 1, 1973, of 4⅔ percent of the principal amount of 5 percent Debentures originally issued, calculated to retire approximately 65 percent of such principal amount prior to maturity.
Optional Redemption: Redeemable at any time prior to maturity, initially at 111.75 percent of principal amount and at prices declining thereafter to par, plus accrued interest.	Redeemable at any time prior to maturity currently (until September 30, 1980) at 102.00 percent of principal amount and at prices declining thereafter to par, plus accrued interest.	Redeemable at any time prior to maturity, currently (until October 31, 1980) at 102.00 percent of principal amount and at prices declining thereafter to par, plus accrued interest.
Subordination: Subordinate to all Senior Indebtedness, as defined, and equal in rank to the Old Debentures.	Subordinate to all Senior Indebtedness, as defined, and equal in rank to the New Debentures.	Subordinate to all Senior Indebtedness, as defined, and equal in rank to the New Debentures.
Listing: Application will be made to list the New Debentures on the NYSE. Listing will be subject, among other things, to meeting the distribution requirements of the NYSE.	The 4¾ percent Debentures may be delisted upon completion of the Exchange Offer if they no longer meet the listing requirements of the NYSE.	The 5 percent Debentures may be delisted upon completion of the Exchange Offer if they no longer meet the listing requirements of the NYSE.

Exhibit 2

Disclosure of Pro Forma Information on Debenture Exchange of Eastern Airlines (taken from its Prospectus dated September 19, 1980)

The following table sets forth certain financial information of the Company and related pro forma information giving effect to the Exchange offer on the assumption that 50 percent and 100 percent, respectively, of the outstanding Old Debentures had been exchanged. The pro forma effects on interest for long-term debt assume that the exchange had occurred on January 1, 1980 and that the New Debentures had been outstanding during the entire period. The pro forma extraordinary gain and balance sheet effects assume that the exchange had occurred on June 30, 1980.

(Amounts in Thousands)	*Actual*	*As Adjusted for 50 Percent Exchange*	*As Adjusted for 100 Percent Exchange*
Balance Sheet as of June 30, 1980:			
Current Maturities of Long-Term Debt	$ 75,882	$ 75,882	$ 75,882
Long-term Debt:			
Nonsubordinated	$370,045	$370,045	$370,045
Subordinated			
4¾% Debentures due 1993	42,950	21,475	—
5% Debentures due 1992	60,999	30,500	—
11¾% Debentures due 2005	—	29,886	59,771
Other	236,433	236,433	236,433
Total Subordinated	340,382	318,294	296,204
Statement of Operations for the Six Months Ended June 30, 1980:			
Interest Expense (2)	$ 58,198	$ 58,667	$ 59,136
Net Income (Loss) Before Extraordinary Item	$(12,463)	$(12,889)	$(13,315)
Extraordinary Item—Gain on Debenture Exchange (2)(3)(4)(5)(6)	—	$ 19,077	$ 38,435
Net Income (Loss)	$(12,463)	$ 6,188	$ 25,120

(1) The table assumes that the initial market value of the New Debentures will be equal to their principal amount. The actual initial market value may be higher or lower than this figure.

(2) The gain resulting from the Exchange Offer will be recognized in 1980, while the effect of increased interest on the New Debentures will continue each year they are outstanding.

(3) The calculations in the table assume that all costs of the Exchange Offer are expensed and have been applied against the gain.

(4) The actual gain to be recognized by the Company for financial reporting purposes may be greater or less, depending upon the initial market value of the New Debentures.

(5) For financial reporting purposes, a tax provision of $1,933,000 assuming a 50 percent exchange and $3,894,000 assuming a 100 percent exchange was made in the "As Adjusted" Gain on Debenture Exchange calculations.

(6) Unamortized issuance expense relating to the Old Debentures ($549,267 at June 30, 1980) has been proportionately applied against the gain.

EXHIBIT 3

LONG-TERM DEBT FOOTNOTE TO EASTERN AIRLINES BALANCE SHEET AS OF DECEMBER 31, 1980 AND DECEMBER 31, 1979

	December 31	
(in $ millions)	*1980*	*1979*
Total Non-subordinated	498.1	396.0
Subordinated		
4¾ percent Subordinated Debentures due October 1, 1993; convertible into common stock at $34 per share; callable	12.8	43.0
5 percent Convertible Subordinated Debentures due November 1, 1992; convertible into common stock at $50 per share; callable	30.3	61.0
11¾ percent Convertible Subordinated Debentures due November 1, 2005; convertible into common stock at $13 per share; callable (5)	32.6	—
<other debt issues>	265.1	228.2
Total subordinated	340.8	332.2

(5) Net of a $2.4 million discount which is being amortized over the life of the issue.

EXHIBIT 4

CONDENSED STATEMENT OF OPERATIONS AND RETAINED EARNINGS FOR EASTERN AIRLINES FOR YEARS ENDED DECEMBER 31, 1980 AND 1979

	Year Ended December 31	
(in $ thousands)	*1980*	*1979*
Total Operating Revenues	3,452,542	2,881,526
Total Operating Expenses	3,450,685	2,770,459
Operating Profit	1,857	111,067
Non-Operating Expense	48,124	50,657
Income (loss) Before Income Taxes and Extraordinary Item	(46,267)	60,410
(Reduction in) Provision for Income Taxes (Note E)	(4,255)	2,779
Extraordinary Item—net of a provision in lieu of income taxes of $2,498 (Note B)	24,654	—
Net Income (Loss)	(17,358)	57,631

EXHIBIT 5

CONDENSED STATEMENT OF CHANGES IN FINANCIAL POSITION FOR EASTERN AIRLINES
FOR YEARS ENDED DECEMBER 31, 1980 AND 1979

	Year Ended December 31	
(in $ thousands)	*1980*	*1979*
Funds Provided By:		
Funds Provided From Operations	173,394	245,570
Extraordinary Item—gain on subordinated debenture exchange	24,654	—
11¾ percent Convertible Subordinated Debenture issued in exchange offer, net of $2,451 discount	32,561	—
<other items>	686,727	630,381
Total Funds Provided	917,336	875,951
Funds Applied For:		
4¾ percent and 5 percent Convertible Subordinated Debentures retired in exchange offer	60,891	—
<other items>	894,668	657,707
Total Funds Applied	955,559	657,707

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Accounting for Hybrid Convertible Debentures

Robert J. Swieringa and Dale Morse

ABSTRACT: This article describes hybrid convertible debentures and how these debentures are currently accounted for, and it proposes an alternative approach for accounting for these debentures. Hybrid convertible debentures are similar to typical convertible debentures in form, but they differ in substance and should be given different accounting treatment.

ACCOUNTING policy-making bodies continually update accounting principles to accommodate new financial contracts. A financial contract that has evolved is a hybrid convertible debenture which may be converted into the common stock of a company other than the company that issued the debenture. For example, in June 1980 Textron, Inc. issued $85,420,000 of 7¾ percent Subordinated Debentures due 2005 which are exchangeable for common stock of Allied Corporation, which is held by Textron. For another example, in December 1982, Corning Glass Works issued $100,000,000 of 8¼ percent Subordinated Exchangeable Debentures due 2007 which are exchangeable for common stock of Owens-Corning Fiberglas Corporation, which is owned by Corning.

The hybrid convertible debentures issued by Textron and Corning Glass Works are not unique. Similar debentures have been issued by Dart Industries (4¼s of 1997 exchangeable into 3M common), International Paper (4¼s of 1997 exchangeable into C. R. Bard common), and Mesa Petroleum Company (8½s of 2000 exchangeable into General American common). By issuing hybrid convertible debentures, the issuing company obtains a significantly lower interest rate, continues to receive dividends on the stock held (85 percent of which is tax-free), and any gains on the exchange are treated as capital gains for tax purposes, with the associated tax liabilities being deferred until the exchanges actually occur. In addition, by allowing conversion into common stock of another company, the issuing company is offering a risk-sharing contract that may not have been available previously to investors. These and other properties make hybrid convertible debentures very attractive for some companies.

At present there are conflicting authoritative pronouncements which may apply to these hybrid convertible debentures. APB *Opinion No. 14* [APB, 1969] defines a convertible debt security

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as a "complex hybrid instrument bearing an option" and concludes that because of the inseparability of the debt and conversion feature, no portion of the proceeds should be allocated to the conversion feature. APB *Opinion No. 21* [APB, 1971] concludes that a note or a bond which is issued with unstated or stated privileges should be accounted for in such a way that recognition is given to these privileges by establishing a note discount or premium account.

This paper describes hybrid convertible debentures and how these debentures are accounted for, evaluates this accounting, and offers an alternative approach.

FEATURES OF THE DEBENTURES

Hybrid convertible debentures are exchangeable prior to maturity for shares of common stock of a company other than the issuer of the debentures. The exchange rate is specified, interest on the debentures usually is payable semiannually, and the debentures often are redeemable at the option of the issuer. In addition, provisions may be included for mandatory sinking fund payments.

The issuer holds shares of common stock of another company. These shares are deposited with an escrow agent to provide for the exchange of all of the debentures issued. The issuer receives and retains all cash dividends paid on the shares held, even though the amount of dividends received may be constrained —e.g., the total of the quarterly dividends may be limited to the prorata share of each quarter's net income or loss, plus some specified amount. Provisions are included to change the exchange rate to reflect any stock dividends or combinations of common stock of the other company. Provisions are also included for the event of a merger, consolidation, or reorganization of the other company.

ACCOUNTING FOR THE DEBENTURES

Issuers of hybrid convertible debentures have accounted for the proceeds at issuance as debt only; no portion of the proceeds has been allocated to the conversion feature or option. This accounting is consistent with APB *Opinion No. 14's* [APB, 1969] treatment of typical convertible debt as debt only. APB *Opinion No. 14* applies to "convertible debt securities which are convertible into common stock of the issuer or an affiliated company at a specified price at the option of the holder and which are sold at a price or have a value at issuance not significantly in excess of the face amount" [APB, 1969, para. 1]. This pronouncement requires that typical convertible debt be treated as debt only, with no portion of the proceeds being allocated to the conversion feature.

Since hybrid convertible debentures are not convertible into the common stock of the issuer or of an affiliated company, it is not clear that the treatment required by this pronouncement for typical convertible debt securities should necessarily be used for hybrid convertible debentures. However, hybrid convertible debentures are similar to typical convertible debt securities in that they reflect "a complex hybrid instrument bearing an option, the alternative choices of which cannot exist independently of one another" [APB, 1969, para. 7].

Typical entries for hybrid convertible debentures are presented in Table 1. These entries reflect Textron's 7¾ percent subordinated debentures due 2005, which were issued on June 15, 1980 and which are exchangeable at any time prior to maturity for shares of common stock of Allied Corporation at an exchange rate of 16.949 shares per $1,000 principal amount of debentures (the equivalent of $59 per share). Interest on the debentures is payable semian-

TABLE 1

CURRENT ACCOUNTING FOR HYBRID CONVERTIBLES

Issuance on June 15, 1980:		
Cash	85,420,000	
7¾ percent Subordinated Debentures		85,420,000
Interest Payment on December 15, 1980:		
Interest Expense	3,310,025	
Interest Payable (or Cash)		3,310,025
(.03875 × $85,420,000)		
If Converted on December 15, 1980:		
7¾ percent Subordinated Debentures	85,420,000	
Investment in Allied Chemical		61,651,000
Gain on Conversion		23,769,000

nually on June 15 and December 15.

At issuance, the Textron debentures were recorded at their face value of $85,420,000; this amount was reflected in Textron's January 3, 1981 consolidated balance sheet. The interest expense of $3,310,025 recorded on December 15, 1980 reflected the 7¾ percent coupon rate of interest multiplied times the face value of the debentures. If and when the Textron debentures are exchanged for the Allied common stock, the entry to record the exchange will reflect a gain on conversion which will equal the difference between the face value of the debentures and the cost (to Textron) of the Allied shares exchanged. The entry in Table 1 assumes that the exchange took place on December 15, 1980.

AN ALTERNATIVE APPROACH

At issuance, a portion of the proceeds from the hybrid convertible debentures can be allocated to the conversion option and credited to a "conversion option" account, with the remainder being allocated to the debentures, resulting in the presentation of a debt discount. Separate accounting for the proceeds from the conversion option is consistent with APB *Opinion No. 21's* treatment of notes issued with stated or unstated privileges:

> A note issued solely for cash equal to its face amount is presumed to earn the stated rate of interest. However, in some cases the parties may also exchange unstated (or stated) rights or privileges, which are given accounting recognition by establishing a note discount or premium account. In such instances, the effective interest rate differs from the stated rate [APB, 1971, para. 1].

It can be argued that hybrid convertible debentures reflect the exchange of debt and a conversion option on stock for cash, and that a portion of the proceeds should be allocated to the conversion option. The amount to be allocated to the conversion option can be calculated indirectly by a present value analysis of the debentures using prevailing market interest rates for an equivalent debenture without the conversion option. A direct calculation of the amount to be allocated to the conversion option can be made using an options pricing model.

Separate accounting for the proceeds from the conversion option results in the debt component of the debentures being fair valued at issuance; that is, the debentures are recorded at their debt-

TABLE 2
AN ALTERNATIVE APPROACH

Issuance on June 15, 1980:		
Cash	85,420,000	
Discount on 7¾ percent Subordinated Debentures	33,017,019	
7¾ percent Subordinated Debentures		85,420,000
Conversion Option on Allied Chemical Stock		33,017,019
Interest Payment on December 15, 1980:		
Interest expense	3,406,194	
Interest payable (or Cash)		3,310,025
Discount on 7¾ percent Subordinated Debentures		96,169
(.065 × $52,402,981)		
If Converted on December 15, 1980:		
7¾ percent Subordinated Debentures	85,420,000	
Conversion Option on Allied Chemical Stock	33,017,019	
Discount on 7¾ percent Subordinated Debentures		32,920,850
Investment in Allied Chemical		51,651,000
Gain on Conversion		23,865,169

only face value which is considerably less than their face value. For example, the amount assigned to the conversion option for the Textron debentures can be measured as the excess of the amount received for the debentures over the estimated market price that could have been obtained for similar debentures without the conversion option. The average market yield for nonconvertible debt securities having the same Baa rating as Textron's issue was 13 percent on June 15, 1980. Using this average market yield, the proceeds from the conversion option can be caluclated as follows.[1]

Total Proceeds		$85,420,000
Proceeds from Debt Only, Assuming 13%:		
$85,420,000 × .0429	$ 3,664,518	
3,310,025 × 14.7245	48,738,463	52,402,981
Proceeds from Conversion Option		$33,017,019

Table 2 presents the entries for the issuance of Textron's debentures on June 15, 1980, the interest payment on December 15, 1980, and the assumed conversion of these debentures on December 15, 1980, if Textron had used this alternative approach. At issuance, Textron's debentures would have been recorded at their fair value of $52,402,981. As reflected above, if these debentures had not been convertible into Allied stock, they would have been sold for $52,402,981 to yield 13 percent. Since the face value was $85,420,000, the discount would have appeared as $33,017,019.

The "conversion option on Allied Chemical stock" account reflects the consideration received for the right of holders of the debentures to receive future increases above $59 per share in the market price of this stock if they occur.[2] This account can be viewed as a "deferred credit" and included among the liabilities in Textron's balance sheet or as a contra asset account against Textron's holdings of this stock. Textron's net investment in Allied Chemical stock would have been as follows at issuance if this account had been reflected as a contra asset account:

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[1] Phalon [1980] suggests that companies of comparable quality were paying 11¾ percent or more for straight debt. Using the 11¾ percent interest rate results in proceeds of $27,404,353 being allocated to the conversion option, which is somewhat less than the amount derived here.

Investment in Allied Stock—at cost	$61,651,000
Less: Conversion Option on Stock	33,017,019
Net Investment in Allied Stock	$28,633,981

The interest expense in each period reflects the imputed market rate of interest at issuance (here assumed to be 13 percent) times the face value of the debentures less the unamortized discount. The interest expense and amortization of the discount increases in each subsequent six-month period.

Textron's accounting for the assumed exchange of the debentures on December 15, 1980 reflects a gain equal to the difference between the book value of the debentures and the cost to Textron of the stock exchanged. The gain on the conversion increases by any additional amortization of discount by the time of conversion.

DISCUSSION

The effects of current accounting for hybrid convertible debentures are reflected in the proceeds at issuance which can be attributed to the conversion option. We have calculated these proceeds to be about $33 million for Textron's hybrid convertible debentures. Consistent with APB *Opinion No. 14* [APB, 1969], current accounting reflects all cash proceeds as debt at issuance, even though the present value of the debentures as straight debt is less than the amount received. Use of the coupon rate of interest to account for interest expense each period results in an understatement of debt expense.[3] In addition, the gain on conversion is understated. No gain at maturity will be recognized if the debentures are not converted. In effect, issuers of hybrid convertible debentures trade off a higher net income in years prior to conversion or maturity for a lower gain at conversion or maturity using current methods of accounting for these debentures.

If the purpose of accounting is to reflect the market value of debt at issuance, then the proceeds from the conversion option should be accounted for separately as a reduction in the issuer's net investment in another company's stock instead of reflected as debt. First, these proceeds reflect consideration received for the right of the debenture holders to receive any market appreciation above the exercise price. Consistent with APB *Opinion No. 21* [APB, 1971], this right should be given accounting recognition by establishing a debt discount at the time of issuance. The amortization of this discount reflects the market rate of interest for equivalent debentures without the conversion option at issuance and eliminates the potential understatement of net income in years prior to conversion or maturity and the understatement of the gain at conversion or maturity.

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[2] In essence, Textron has sold the right tail of the probability distribution of the outcomes for Allied's common stock.

[3] The coupon rate is referred to here because the Textron debentures were issued at par and all of the cash proceeds were reflected as debt. If Textron's debentures had not been issued at par (but all of the cash proceeds were still reflected as debt), the effective yield or market interest rate on these proceeds would have differed from the coupon rate and the entries in Table 1 would have reflected discount or premium accounts to account for this difference over the life of the debentures.

However, neither the coupon rate nor an effective yield on all cash proceeds reflects the "effective interest rate" referred to in APB *Opinion No. 21* [APB, 1971, para. 1]. The "effective interest rate" should be the market interest rate for an equivalent debenture without the conversion option at issuance. As reflected in Table 2, this market rate should then be multiplied times the present value of the debentures without the conversion option (i.e., straight debt) in calculating interest expense. The interest expense will increase through time as the bond discount is amortized. Use of a coupon rate or effective yield on all of the cash proceeds results in an understatement of debt expense over the life of the debentures compared to the approach required by APB *Opinion No. 21* [APB, 1971].

Second, if the proceeds are accounted for separately, the "conversion option" account should be reported as a contra asset account against the issuer's holdings of this stock instead of as a deferred credit. This contra asset account would reflect the decrease in value of the stock to the issuer because the bondholders would capture any price appreciation beyond the exercise price. A precedent for this treatment is provided by accounting for covered call options. If an investor sells a call option on stock owned, the proceeds are used to reduce the investor's purchase cost. For example, if an investor purchases a stock for $100 and then sells a call option for $5, the net purchase cost is $95. Also, if the stock's market value declines, the investor does not recognize a loss until the market value drops below the purchase price less the proceeds from the option; that is, the investor does not recognize a loss until the market value drops below $95.

The only authoritative pronouncement which refers to accounting for call options is FASB *Statement No. 12* [FASB, 1975], which states that "when an entity has taken positions involving short sales, sales of calls, and purchases of puts for marketable securities and the same securities are included in the portfolio, those contracts shall be taken into consideration in the determination of the market value of the marketable equity securities" [FASB, 1975, para. 7(b)]. Giardina [1978] suggests that to preserve comparability of cost and market data appearing in the balance sheet and footnotes, this requirement implies that "the proceeds of an option sold must be deferred at least until expiration, and presented as a contra to the cost of the stock" [Giardina, 1978, p. 74].

Presenting the proceeds from the conversion option as a contra asset account may have implications for the use of a lower of cost or market rule if the market value of the stock held declines. For example, at January 3, 1981 the market value of Textron's investment in Allied stock was $78.2 million, which was above its cost of $61.7 million. But, at times during 1981 and 1982 the market value of Textron's investment in Allied stock dropped below its cost. Consistent with the call option example above, Textron would not have to recognize a loss or write-down to lower of cost or market until the market value drops below about $28.7 million (e.g., its cost of $61.7 million less the proceeds of $33 million). However, if Textron had presented the proceeds from the conversion option as a deferred credit, it would have to recognize a loss or write-down to lower of cost or market if the market value drops below its cost of $61.7 million.

Presenting the proceeds from the conversion option as a contra asset account may result in a deferred credit if the cost basis of the stock held is very low. For example, Corning Glass Works' cost basis for its investment in Owens-Corning Fiberglas Corporation stock was about $3 million in November 1982. On December 1, 1982, Corning issued $100,000,000 of 8¼ percent subordinated debentures due 2007 which are exchangeable for common stock of Owens-Corning Fiberglas Corporation.

The debentures were rated A2 by Moody's; the average interest rate for A2 bonds was 12.36 percent in November 1982. The proceeds at issuance which could be attributed to the conversion option amounted to about $32 million. If Corning had presented these proceeds as a contra asset account, its net investment in Owens-Corning Fiberglas would have been a credit of about $29 million, which could have been reflected as a deferred credit in Corning's consolidated balance sheet.

How should hybrid convertible securities be accounted for? As suggested in this article, existing pronouncements provide conflicting precedents. Readers familiar with the debate about accounting for typical convertibles in the late 1960s and early 1970s may conclude that hybrid convertibles are essentially the same as typical convertibles and therefore the precedent of APB *Opinion No. 14* [APB, 1969] should apply. Typical and hybrid securities may be similar in form, but they are different in substance.

Where typical convertibles raise concerns about whether the proceeds for the conversion feature are "debt" or "equity," hybrid convertibles raise concerns about whether these proceeds are "debt" or "reductions of net investment." In other words, hybrid convertibles raise questions about the measurement of assets.

Where typical convertibles result in additional paid-in capital upon conversion, hybrid convertibles result in gains upon conversion and these gains are included in income. Hybrid convertibles raise questions about income measurement. The amortization of imputed discount affects periodic income, but it also affects the amounts of the gains on conversion or exchange. The issue here is the measurement of periodic income over the life of the debt.

APB *Opinion No. 21* [APB, 1971] tries to deal with these asset and income measurement issues by giving accounting recognition to the stated rights or privileges reflected by the conversion feature. This article has illustrated the effects of relying on one pronouncement instead of another. It is time for accountants to consider the characteristics of these hybrid convertible debentures and to deal with the conflicting precedents for their accounting treatment.

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Charge: To administer the John R. Wildman Medal in accordance with the terms of the grant from the Deloitte Haskins & Sells Foundation.

Chairman: Robert J. Swieringa, Cornell University
Members: William G. Cole, Deloitte Haskins & Sells Foundation, Inc.
Daniel W. Collins, University of Iowa
W. Morley Lemon, University of Waterloo
Frank R. Rayburn, The University of Alabama

DOCTORAL CONSORTIUM COMMITTEE

Charge: 1. To plan the 1985 Doctoral Consortium.
2. Upon approval and funding, to arrange to have the Consortium conducted and administered.
3. To report on its results, effectiveness, and recommended changes by November 1, 1985.

Chairman: Gary John Previts, Case Western Reserve University
Members: Barry E. Cushing, University of Utah
Katherine Schipper, University of Chicago
Mary S. Stone, University of Alabama

DOCTORAL PROGRAMS COMMITTEE

Charge: To propose actions the Association may take to improve the quality of doctoral studies in accounting and the quantity of doctorates awarded in accounting.

Chairman: Wanda A. Wallace, Southern Methodist University
Members: Thomas J. Burns, The Ohio State University
Richard W. Metcalf, University of Nebraska-Lincoln
Richard S. Savich, University of Southern California
Charles H. Smith, University of Illinois

EDUCATION ADVISORY COMMITTEE

Charge: 1. To develop and issue position statements on matters relating to accounting education.

2. To develop and recommend to the Executive Committee educational policy for the Association.

3. To initiate, coordinate and administer the activities of the Association in the field of accounting education, including accounting education research.

4. To coordinate the work of committees for the Doctoral Consortium, New Faculty Consortium, Trueblood Seminars, Professional Examinations and other education-related committees that may be established during the year.

Chairman: Donald L. Madden, University of Kentucky
Members: David A. Dittman (1985), Duke University
Daniel L. Jensen (1986), The Ohio State University
Salvatore Luiso (1987), Coopers & Lybrand
Bernard J. Milano (1985), Peat Marwick Mitchell & Co.
Belverd E. Needles, Jr. (1987), DePaul University
Loren A. Nikolai (ex-officio), University of Missouri
Lawrence C. Phillips (1987), Texas Tech University
Joseph E. Rhile (1985), Lake Sumter Junior College
David N. Ricchiutte (1986), University of Notre Dame

FEDERAL TAX COMMITTEE

Charge: 1. To initiate and develop, when deemed appropriate, proposals to national legislative bodies and their associated committees.

2. To respond to requests for input to proposed legislation and regulations, including oral testimony when appropriate.

Chairman: Dennis J. Gaffney, Michigan State University
Members: Richard Boley, Georgetown University
John L. Kramer, University of Florida
Brian L. Laverty, Indiana University
G. Fred Streuling, Brigham Young University
Mark J. Sullivan, DePaul University

FINANCIAL ACCOUNTING STANDARDS COMMITTEE

Charge: To evaluate selected discussion memoranda and exposure drafts related to financial accounting in the private sector as they are released by the Financial Accounting Standards Board and to respond to the FASB in writing and by appearing at public hearings if necessary.

Chairman: Lewis F. Davidson, Florida International University
Members: Dan S. Dhaliwal, University of Arizona
Spencer J. Martin, University of Rhode Island
Paul B. W. Miller, University of Utah
Michael G. Tearney, University of Kentucky

THE FUTURE STRUCTURE, CONTENT, AND SCOPE OF ACCOUNTING EDUCATION AND PRACTICE COMMITTEE

Charge: To examine the changing environment of accounting practice and identify the potential impact upon accounting education and research by the year 2001. The Committee is to consider the possibility that neither accounting education (research and teaching), nor accounting practice, are keeping up with the mass of changes taking place in our economic and social society. The Committee should provide specific recommendations for adjusting accounting education to the new environment.

Chairman: Norton M. Bedford, University of Illinois
Members: E. E. Bartholomew, Arthur Young & Company
Charles A. Bowsher, General Accounting Office
Abbott L. Brown, Price Waterhouse
Sidney Davidson, The University of Chicago
Charles T. Horngren, Stanford University
Herbert C. Knortz, ITT Corporation
M. Mendel Piser, Crowe, Chizek & Company
William G. Shenkir, University of Virginia
John K. Simmons, University of Florida
Edward L. Summers, University of Texas at Austin
John T. Wheeler, University of California-Berkeley

INTEGRATING THE COMPUTER INTO THE COST/MANAGERIAL CURRICULUM COMMITTEE

Charge: 1. To prepare an instructor's manual for integrating the microcomputer into the undergraduate cost/managerial curriculum and propose a plan for updating the manual.

2. To propose a plan for the Association to disseminate to the membership current information on microcomputer applications in the accounting curriculum.

Chairman: Ronald L. Clark, University of Georgia
Members: Robert Capettini, Duke University
Anthony Carbone, Massachusetts Bay Community College & Babson College
John W. Hardy, Brigham Young University
Dora R. Herring, Mississippi State University
James A. Knoblett, University of Kentucky

INTEGRATING THE COMPUTER INTO THE UNDERGRADUATE FINANCIAL ACCOUNTING CURRICULUM

Charge: 1. To prepare an instructor's manual for integrating the microcomputer into the Financial Accounting curriculum and propose a plan for updating the manual.

2. To propose a plan for the Association to disseminate to the membership current information on microcomputer applications in the accounting curriculum.

Chairman: Mark F. Asman, Bowling Green State University
Members: Richard E. Baker, Northern Illinois University
Louis F. Biagioni, Indiana University
Keith Ehrenreich, California State Polytechnic-Pomona
Frederic M. Stiner Jr., University of Delaware

INTERNATIONAL ACCOUNTING COMMITTEE

Charge: 1. To document how financial accounting standards are being promulgated in various countries, and

2. to analyze the implications of various national standard setting processes for the development and acceptance of international accounting standards.

Chairman: Jane O. Burns, Indiana University
Members: Adolf J. H. Enthoven, University of Texas at Dallas
Konrad W. Kubin, Virginia Polytechnic Institute & State University
Desmond McComb, University of Southampton
Adrian Wong-Boren, San Diego State University

INTERNATIONAL FACULTY EXCHANGE COMMITTEE

Charge: 1. To advise the Executive Committee on the extent of this program for the 1984-85 year and for subsequent years including issues of funding for the program.

2. To select the professors to be involved in the program for 1984-85.

3. To assist the Executive Director with the arrangements and the distribution of necessary materials for the visits.

Chairman: George J. Staubus, University of California, Berkeley
Members: Bala V. Balachandran, Northwestern University
Frederick D. S. Choi, New York University
Gary M. Cunningham, Virginia Polytechnic Institute & State University

INVESTMENTS COMMITTEE

Charge: To formulate and recommend to the Executive Committee policies and actions for managing the Association's financial resources.

Chairman: Alvin A. Arens, Michigan State University
Members: Harold Q. Langenderfer, University of North Carolina, Chapel Hill
Ray M. Sommerfeld, University of Texas at Austin

MEMBERSHIP COMMITTEE

Charge: To increase the quantity and quality of membership of the Association.

Chairman: Robert E. Holtfreter, Fort Hays State University
Members: Herman R. Andress, Santa Fe Community College
Surendra P. Agrawal, Memphis State University
Walter O. Baggett, Manhattan College
Bruce A. Baldwin, Arizona State University
Allen W. Bathke, Jr., Florida State University
Ronald R. Bottin, University of Wisconsin-La Crosse
Russell F. Briner, The University of Mississippi
Donald W. Brown, Iowa State University
E. Lewis Bryan, Clemson University
John R. Cerepak, Farleigh Dickinson University
Michael D. Chase, California State University-Long Beach
Lanny G. Chasteen, Oklahoma State University
Jean Crawford, University of South Alabama
Michael DeCelles, University of Alaska, Anchorage
Hassan Espahbodi, Northeastern University
Henry Fuentes, Farleigh Dickinson University
Alan S. Glazer, Franklin & Marshall College
Robert R. Greenberg, Washington State University
Paul Guttmann, San Jose State University
Charles Hamilton, University of Rhode Island
Richard Hodges, University of Nebraska at Omaha
James Hood, Northeast Louisiana State University
Gerald B. Hoth, Weber State College
Johnny R. Johnson, University of Georgia
Stuart Keller, University of Kentucky
Lawrence Klein, University of Wyoming
LeRoy R. Lee, University of Wyoming
Patsy Lee, University of Denver
Linda Lovata, University of Notre Dame
Jean S. McClure, University of Maine at Orono
Charles L. Martin, University of Baltimore
Dale R. Martin, Wake Forest University
Rebekah J. Maupin, University of Hawaii
Ronald A. Milne, University of Nevada-Las Vegas
Charles K. Moore, Jr., University of Akron
Philip R. Olds, Virginia Commonwealth University
Richard Pitre, University of Houston, Clear Lake
Shirley Polejewski, College of St. Thomas
Dennis L. Rebber, The Citadel Military College
Alan Reinstein, Oakland University
Max Rexroad, Illinois State University
Edmund Scribner, New Mexico State University
Thomas I. Selling, Dartmouth University
Mary Alice Seville, Oregon State University
Gail A. Shaw, West Virginia University
William O. Stratton, Washington State University
C. William Thomas, Baylor University
William Thomas, George Washington University
Gary A. Volk, University of South Dakota
Joseph Weber, University of Montana
JacksonWhite, University of Arkansas at Little Rock
Harold H. Wilde, University of North Dakota
Earl R. Wilson, University of Missouri
John H. Wragge, University of Delaware
Harold Wyman, University of Connecticut

MINORITY FACULTY DEVELOPMENT COMMITTEE

Charge: 1. To liaison with the AICPA, NABA and other organizations that are working to increase the number of minority faculty teaching in accounting programs.

2. To initiate other activities to foster an interest in doctoral work in accounting, such as the preparation of materials in academic careers in accounting for minorities and collection of data on doctoral program support.

3. To prepare a plan for development for minority faculty members.

Co-Chairmen: Professor George O. Gamble, University of Houston, Central Campus
Professor Robert K. Zimmer, University of Denver
Members: Matthew Anderson, University of Minnesota-Twin Cities
Brenda Birkett, Southern University
Quiester Craig, North Carolina A&T State University
Harold M. Sollenberger, Michigan State University

NOMINATIONS COMMITTEE

Charge: To nominate members of the Executive Committee and Council Members-at-Large.

Chairman: Thomas R. Dyckman, Cornell University
Members: Horace Brock, North Texas State University
Yuji Ijiri, Carnegie-Mellon University
John L. Kramer, University of Florida
Harold Q. Langenderfer, University of North Carolina, Chapel Hill
Paul Pacter, City of Stamford
Joseph Schultz, Arizona State University

NOTABLE CONTRIBUTIONS TO ACCOUNTING LITERATURE AWARD COMMITTEE

Charge: Screening Group—To identify works of exceptional merit from books and articles that meet the guidelines established by the Executive Committee.

Nominating Group—To nominate to the AICPA-AAA Notable Contributions to Accounting Literature Committee up to five selected books and articles each from those identified by the Screening Group as accounting literature. Each nomination should be accompanied by an explanatory discussion of why the work should be considered to be a notable contribution.

Chairman: Eugene E. Comiskey, Georgia Institute of Technology
Members (Screening Group): Carol Eger, Stanford University
Nabil Hassan, Wright State University
Robert W. Ingram, University of Iowa
Melvin O'Connor, Michigan State University
Grover L. Porter, University of Mississippi
Members (Nominating Group): Andrew H. Barnett, San Diego State University
Germain Boer, Vanderbilt University
E. Richard Brownlee, University of Virginia
Cornelius J. Casey, Jr., Dartmouth College
James L. Chan, University of Illinois at Chicago
Linda DeAngelo, University of Rochester
Bala G. Dharan, Rice University
Ray D. Dillon, Georgia State University
Gordon L. Duke, University of Minnesota
N. Allen Ford, University of Kansas
H. Perrin Garsombke, University of Wyoming
Willis R. Greer, Jr., Naval Postgraduate School
Hugh D. Grove, University of Denver
Al L. Hartgraves, Emory University
Wayne E. Leininger, Virginia Polytechnic Institute & State University
Joseph G. Louderback, Clemson University
Ronald M. Mano, University of Utah
Alan P. Mayer-Sommer, Georgetown University
Trini M. Melcher, California State University-Fullerton
James C. Noel, Carnegie-Mellon University
Larry M. Parker, University of Wyoming
Ram Ramakrishnan, Massachusetts Institute of Technology
Michael J. Sandretto, Harvard University
James H. Scheiner, University of Tennessee
Keith A. Shriver, Arizona State University
Ray G. Stephens, The Ohio State University
Relmond P. Van Daniker, University of Kentucky
Frederick H. Wu, Southern Illinois University at Carbondale

PEAT, MARWICK, MITCHELL AUDITING SEMINARS COMMITTEE

Charge: To assist Peat, Marwick, Mitchell & Co. in the conduct of the auditing seminar series.

Chairman: Ray Whittington, San Diego State University
Members: Dennis Lee Kimmell, The University of Akron
Jack L. Krogstad, Creighton University

PROFESSIONAL EXAMINATIONS COMMITTEE

Charge: 1. To evaluate the appropriateness of the CPA, and possibly other licensing examinations, to determine whether any of the examinations should be changed, either as to content coverage or level of difficulty, or both, as a vehicle for influencing accounting education. The Committee is encouraged to identify and elaborate on specific examples of needed changes.

2. To continue to work closely with the AICPA's Examination Division during this period of in-depth review and potential change, and to provide appropriate input from the AAA.

3. To develop programs and methods relating to examination objectives, content, techniques, and analysis which may benefit members of the academic and professional examination communities.

4. To elicit questions and problems together with solutions from members for use in licensing and other accounting certification examinations.

Chairman: Alan P. Johnson, California State University, Hayward
Members: Eugene H. Flegm, General Motors Corp.
Joe E. Fritzemeyer, Arizona State University
James K. Loebbecke, University of Utah
David B. Pearson, Arthur Young & Co.
Karl E. Reichardt, Institute of Management Accounting
Mitchell Rothkopf, American Institute of CPA's
Donald H. Skadden, University of Michigan
Robert R. Sterling, University of Utah
Dan Sweeney, Institute of Internal Auditors, Inc.
Milton F. Usry, Oklahoma State University

1985 ANNUAL MEETING PROGRAM ADVISORY COMMITTEE

Charge: 1. To issue a call for papers for the 1985 AAA Annual Meeting; to review the papers received, and recommend those papers to be presented in concurrent sessions.

2. To recommend moderators, presiders and discussants, as appropriate, for each concurrent session.

Chairman: Jan R. Williams, University of Tennessee
Members: W. Steve Albrecht, Brigham Young University
C. Wayne Alderman, Auburn University
Herman R. Andress, Santa Fe Community College
Robert C. Fess, San Jose State University
Jack C. Gray, University of Minnesota
Robert E. Holtfreter, Fort Hays State University
Stephen T. Limberg, The University of Texas at Austin
Cristi K. Lindblom, University of Connecticut
James G. Manegold, University of Southern California
William E. McCarthy, Michigan State University
Gary Meek, Oklahoma State University
Thelma Mitchell, Indiana University/Purdue University, Fort Wayne
James Patton, University of Pittsburgh
Russell J. Petersen, University of Iowa
Douglas A. Snowball, University of Florida
Robert J. Swieringa, Cornell University
Mikel G. Tiller, The University of Tennessee
Carl S. Warren, University of Georgia
Alan J. Winters, American Institute of Certified Public Accountants

PUBLIC SECTOR ACCOUNTING COMMITTEE

Charge: 1. To initiate studies related to public sector accounting issues in order to provide an early input to public sector accounting bodies involved in the decision process regarding such issues.

2. To evaluate discussion memoranda, exposure drafts, and other proposals issued by the FASB, the GASB and other public sector bodies that are related to public sector accounting issues and respond to these proposals in writing and by appearing at public hearings if necessary.

3. To study the educational ramifications of governmental and other public sector accounting standards and make recommendations for incorporating appropriate public sector accounting concepts into the accounting curriculum at desired levels of the accounting education process.

Chairman: Robert W. Parry, Jr., Indiana University
Members: Robert J. Freeman, Texas Tech University
William W. Holder, University of Southern California
Walter A. Robbins, University of Alabama
Abraham J. Simon, Queens College-CUNY

PUBLICATIONS COMMITTEE

Charge: To propose a strategy for the AAA's publications function to (1) best serve the education and research needs of the AAA membership and to (2) fulfill the leadership responsibility of the AAA.

Chairman: Harold Q. Langenderfer, University of North Carolina, Chapel Hill
Members: Robert N. Anthony, Harvard University
William W. Cooper, University of Texas at Austin
William L. Ferrara, Penn State University
Roger H. Hermanson, Georgia State University
D. Gerald Searfoss, Touche Ross & Company
Stephen A. Zeff, Rice University

RELATIONS WITH OTHER ORGANIZATIONS COMMITTEE

Charge: To recommend policies for the AAA pertaining to relations with appropriate other academic and professional organizations, both domestic and international.

Chairman: Yuji Ijiri, Carnegie-Mellon University
Members: Andrew D. Bailey Jr., University of Minnesota
Gerhard G. Mueller, University of Washington
David Solomons, University of Pennsylvania

RESEARCH ADVISORY COMMITTEE

Charge: 1. To advise the Director in the development and administration of the Association's accounting research program, and

2. to suggest innovations to improve the Association's research program by raising the quality of accounting research, or by improving communication between practitioners and consumers of accounting research.

Chairman: William R. Kinney, Jr., University of Michigan
Members: Rick Antle, University of Chicago
Robert Holthausen, University of Chicago
Silvia A. Madeo, University of Iowa
William E. Ricks, Duke University
William F. Wright, University of Minnesota

SECURITIES AND EXCHANGE COMMISSION LIAISON COMMITTEE

Charge: 1. To determine what aspects of SEC accounting are included in the accounting curricula of appropriate colleges and universities.

2. To make recommendations as to what SEC processes and pronouncements should be included in designated accounting curricula, including the identification of ways of implementing SEC topics into specified curricula.

3. To continue to develop and implement means for providing input and assistance to the SEC by academic accountants.

Chairman: John H. Smith, Securities and Exchange Commission
Members: Jerry L. Arnold, University of Southern California
Harvey S. Hendrickson, Florida International University
Eugene L. Zieha, University of Missouri-Columbia

STUDENT FELLOWSHIPS COMMITTEE

Charge: To select the 1985-86 recipients of American Accounting Association grants and determine, within the guidelines established by the Executive Committee, amounts of their awards.

Chairman: Charles Neyhart, Oregon State University
Members: Jose A. Gonzalez, Kent State University
Gary E. White, Texas Tech University

TRUEBLOOD SEMINARS COMMITTEE

Charge: To assist Touche Ross & Co. in planning and conducting Trueblood Seminars, which are staffed and funded by Touche Ross & Co.

Chairman: Loren A. Nikolai, University of Missouri
Members: James J. Benjamin, Texas A&M University
Larry N. Killough, Virginia Polytechnic Institute & State University
Thomas S. Wetzel, Northern Illinois University

THE ACCOUNTING REVIEW
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BOOK REVIEWS

Harvey S. Hendrickson, Editor

EDITOR'S NOTE: Books for review should be sent to Professor Harvey S. Hendrickson, School of Accounting, College of Business Administration, Florida International University, Miami, FL 33199.

(The policy of the *Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.)

URTON ANDERSON, *Quality Assurance for Internal Auditing* (Altamonte Springs, FL: The Institute of Internal Auditors, Inc., 1983, pp. xvii, 148, $60.00).

Modern society depends greatly upon the services provided by professionals and specifically the services of auditors—both internal and external. These professionals are granted a high degree of autonomy in performing these services and in exercising judgment and discretion. In addition, the difficulty in assessing the quality of professional services creates a need for trust on the part of the user/client. This trust depends on the quality of these services.

The "Standards for the Professional Practice of Internal Auditing" (Institute of Internal Auditors) requires the director of an internal auditing department to establish a quality-assurance program to evaluate the operations of the department. For the most part, compliance with the standard has resulted in external reviews being conducted by CPA firms and not internal auditors.

This book is the result of a research project sponsored by the Institute of Internal Auditors to study the feasibility of "peer review" as a mechanism for external reviews of internal audit departments where the reviews are conducted by qualified internal auditors outside the organization being reviewed.

The project used the methodology set forth in Glazer and Jaenicke's "A Framework for Evaluating an Internal Auditing Function" (Institute of Internal Auditors) to arrive at suggestions for improvements and additions.

The book is divided into two parts and five appendices, plus a comprehensive bibliography.

The three chapters of Part 1 cover in good detail why society depends upon professional services, the acceptance of a need for external review of the operations of internal audit departments, and the reasons why "peer review" is more than an audit.

In Part 2, the first five chapters describe the conduct of a peer review and the problems that may be encountered. The research project involved conducting actual peer reviews of three audit departments. These reviews constituted the basis for the description of the peer review process and the suggested modifications of the "Framework." In Chapter 7 the auditees' views of the internal audit function are surveyed. This is a significant contribution to the full understanding of the basic concept of internal auditing. Chapter 9 contains the contents and format of the formally written reports for each external review, and presents a systematic approach to arrive at an opinion of a department's compliance with the "Standards."

The author states in Chapter 10 that peer reviews are feasible. He also concludes that the reports resulting from such reviews have a positive impact upon the auditees, the internal audit departments involved, and the members of the review teams.

This book is a valuable addition to a reference library for a serious student of internal auditing, members of a peer review team, and any internal audit department considering an external peer review. The book is easy to read and understand and is well documented.

FRED J. MUELLER
Professor of Accounting
University of Washington

VINOD B. BAVISHI and HAROLD E. WYMAN, *Who Audits the World: Trends in the Worldwide Accounting Profession*

(Storrs, CT: The Center for Transnational Accounting and Financial Research, University of Connecticut, 1983, pp. xviii, 1075, in U.S. $75.00 paper, elsewhere $90.00 paper).

Bavishi and Wyman contend that this book constitutes the first comprehensive study of the international auditing profession. The authors analyzed data from the financial statements of over 10,000 leading companies worldwide, office directories of the 13 largest international accounting firms, and published financial statements of those firms to determine: (1) the organizational structure of the international auditing profession; (2) the market structure of the international auditing profession in terms of concentration and specialization by country/region/industry; and (3) key firm economic factors, including profitability, and the determinants of audit fees in the international auditing profession.

Using 1981 U.S. company and 1980 foreign company financial reports, the authors identified the following variables for each company: (1) one of 25 industry classifications, (2) whether operations were multinational, (3) consolidated sales and assets (converted to U.S. dollars), (4) year-end date, (5) auditor of record, and (6) whether the auditor had an international affiliation. Subject companies were further classified as operating in industrial or developing countries and by five international geographical regions.

The book is organized into eight chapters and nine supporting appendices, the latter constituting nearly 90 percent of the text. Each research issue chapter begins with a clear identification of the research questions, presents analyses, and concludes with the major findings. The authors wisely do not bombard the reader with narration on the tabular data. Major points are made, allowing the reader to glean that which is of interest. Cross-referencing to supporting appendices is excellent and the nature of the appendices is easily interpreted.

Chapter 1 introduces the research objectives and the study design, while Chapter 8 summarizes the more salient findings. Chapter 2 provides, by region, country, and major city, an analysis of organization of the 13 largest firms, office locations, and partners per office. Chapter 3 contains interesting insights into relative profitability of those firms publishing financial information. While all firms reported real revenue growth, one firm was shown to have significantly higher returns on revenue and a shorter collection period. Chapter 4 provides an analysis of industry market concentration for the major auditors by country. Insights include: (1) while no one firm dominates any world industry, a definite "Big Nine" exist, and (2) most international firms have failed to expand services in developing countries. Chapter 5 presents evidence that the majority of subsidiaries of multinational companies have different auditors than parent companies. Business executives and auditors will find the Chapter 6 analysis of audit fees in selected countries to be of interest. Certain firms are shown to collect higher fees, after controlling for size and industry. Chapter 7 analyzes overall international firm market share growth between 1971 and 1980 in the U.S., U.K., Canada, and Australia. While small in the U.S., share growth was quite large elsewhere.

This book is largely a data base. It contains a wealth of data for the international accounting researcher. Both corporate executives involved in auditor selection and students contemplating Big Eight career choices may find the comparative firm data useful. Finally, the major auditing firms are provided with a unique opportunity to assess their practices vis-a-vis their competitors.

DONALD K. MCCONNELL, JR.
Associate Professor of Accounting
University of Texas at Arlington

JAN BELL, Editor, *Accounting Control Systems: A Behavioral and Technical Integration* (New York: Markus Wiener Publishing, Inc., 1983, pp. xi, 355, $18.00 paper).

The title of this book accurately describes this collection of reprinted articles. Professor Bell states that "[t]he articles in this anthology provide an overview of the development of management accounting" (p. x). To accomplish this objective, he has skillfully blended diverse articles highlighting technical and behavioral contributions to the basic problems encountered in designing internal accounting systems.

The readings are divided into four parts, each consisting of four to six articles—a total of 21 concept-oriented readings. The editor has included a short introduction to each part that gives the reader a perspective and helps to integrate the readings.

Part I contains articles on the development of management accounting and the design of accounting control systems from the standpoint of three competing approaches: 1) technical cost-benefit, 2) behavioral, and 3) integrated. Part I begins with a thought-provoking article by Horngren entitled "Management Accounting: Where Are We?"; another is the classic, "Behavioral

Assumptions of Management Accounting" by Caplan; and ends with an article by Ansari discussing the need for accountants to approach control systems design from the standpoint of both technical-structural and behavioral assumptions. These readings give the student a conceptual framework from which to review the remaining readings.

Part II contains four articles that deal with stimulating and complex issues related to budgetary control: how budgets should be used to motivate; the extent to which budget-related behavior is dependent on the organization structure; and the impact on people of budget data used in performance evaluation. Students who have only a general background in organization theory should be able to comprehend the main thoughts in these readings.

Part III contains articles on cost-volume-profit analysis, direct versus absorption costing, transfer pricing, and variance investigation decisions. Included are such well-known articles as "Cost-Volume-Profit Analysis Under Conditions of Uncertainty" by Jaedicke and Robichek, and "The Significance and Investigation of Cost Variances: Survey and Extensions" by Kaplan. Some of the articles in this section are very readable, while others, such as those on transfer pricing and variance investigations, contain a great deal of mathematical and statistical material. Students with a nominal background in quantitative methods may not fully understand all of the material in these articles, but they should be able to grasp most of the major ideas.

Part IV has six articles that focus on performance measurement. These articles are interesting and most are relatively brief. They contain criticisms of existing methods of performance measurement. For example, an article by Arthur Thomas, "Useful Arbitrary Allocations," rejects allocations in general-purpose financial statements because they violate the "neutrality" objective of financial accounting. Ridgway's "Dysfunctional Consequences of Performance Measurements" criticizes the use of a single quantitative measure of performance such as ROI, and advocates the use of multiple or composite measures, but with careful consideration of their behavioral effects. The articles in this section should stimulate the serious student of management accounting to do further reading.

In summary, this book brings together an excellent collection of articles that will give useful perspectives on the discipline of management accounting. As the editor intends, the readings could be used to supplement basic textbooks in management accounting at both the undergraduate and graduate levels.

FRED A. THORNTON
Associate Professor of Accounting
The University of West Florida

LEONARD EUGENE BERRY, *Coordinating Total Audit Coverage: Trends and Practices* (Alamonte Springs, FL: The Institute of Internal Auditors Research Foundation, 1983, pp. vii, 96, $33.00 paper).

Internal auditors and external auditors alike are aware of the implications for reducing total audit costs that are contained in SAS No. 9. Many external audit firms, in a coordinated, joint audit effort with their clients' internal auditors, are effectively achieving such cost reductions. But the author maintains that effective coordination of audit efforts has not been achieved at a reasonable level across the auditing profession because internal auditors are not aware of the solutions to their coordination problems and the potential benefits that would result from such a coordination system.

The author further argues that the advances in coordination practices that have taken place in the internal audit community have not been communicated adequately throughout the practice environment. Thus, the more effective coordination methods, conceptual approaches, and problem solution techniques that have been developed and successfully applied in isolated situations have not been widely adopted.

The purposes of this study are 1) to identify the emerging and existing coordination concepts and methods that have proven effective in selected organizations, and 2) to communicate them to all internal audit managers and external auditors who are interested in improving audit coverage and controlling audit costs. Data for the study were gathered through 1) on-site interviews with internal audit managers and examination of work-paper documentation at eight large companies, 2) on-site interviews with the external auditors of six of the above companies and examination of their work-papers, and 3) telephone interviews with internal audit managers of six additional companies.

The primary audience of the book is apparently intended to be audit practitioners, both internal and external. The subject matter is covered succinctly and thoroughly, and the stated objectives appear to be achieved. Sufficient supplementary material, such as checklists and case examples, is provided to enable practitioners to evaluate and implement the recommendations for cost savings and better audit effectiveness.

The book appears to have limited academic usefulness as a supplement or a reference in either an advanced auditing course or one with significant time dedicated to internal auditing and operational ways to cut audit costs. But such use, other than as a reference, seems unlikely due to the relatively high cost of the book.

D. DEWEY WARD
Associate Professor of Accounting
Michigan State University

GORDON B. DAVIS, DONALD L. ADAMS, and CAROL A. SCHALLER, *Auditing & EDP*, Second Edition (New York: American Institute of Certified Public Accountants, 1983, pp. xxiv, 413, $25.00).

The first edition of this book was published in 1968 and at the time was one of the few comprehensive EDP audit reference materials available for academics or practitioners (reviewed April 1969, pp. 423–424). This, the second edition, provides an update following 15 years of technical evolution in a volatile industry. In addition to technological updating, this edition has had significant conceptual changes. While the book is still claimed to be a guide to assist practicing CPAs, the apparent intent is to provide a summary of general EDP knowledge required of all auditors. On the introductory side, the book assumes the reader already has a fundamental understanding of data processing and auditing. On the advanced side, the book stops short of providing detailed explanations or comprehensive procedural checklists for any of the more complex computer topics. Between the introductory and advanced levels, this book presents descriptive training materials oriented toward a general understanding of a wide variety of computer topics.

Another change from the first edition involves the authorship. The second edition, like the first, includes the disclaimer that the book does not represent an official position of the AICPA or any of its senior technical bodies. But the first edition was the result of a special task force comprised primarily of practicing CPAs that was headed by Professor Davis, while one of the three second-edition authors is an Institute employee.

The book has five major sections plus six appendices. The first section describes the auditor's role in a changing EDP environment and basic EDP control classifications. Recent trends in data processing recognized as having significant auditing impact include data communications, small computers, database management systems, and distributed processing. This reviewer agrees with the trends and control classifications introduced, but notes that the emphasis on recent trends is not maintained throughout the remaining sections of the book. Recent technology in database management systems (DBMS) and related audit implications are covered well in two subsequent chapters devoted to DBMS, but the three other identified trends do not receive adequate subsequent attention. One chapter is devoted to small computers but falls short of recognizing the extent of microcomputer involvement in the audit process. Specific attention given to data communications and distributed processing is minimal.

General controls including organization, documentation, and hardware features are included in the second section as well as a chapter introducing DBMS. The general control chapters are supported by three of the six appendices, including a sample EDP internal control questionnaire, example documentation, and flow-charting. The text discussions and example appendices are relevant updates of similar material in the first edition and provide excellent coverage of the material.

The third section covers controls and processing methods for accounting applications while the fourth discusses computer audit tools and techniques. The most significant change in this material is the addition of a second chapter on DBMS. Other topics have been reorganized and updated but provide no significant variation from the first edition. Two supporting appendices that include practical checklists for evaluating the audit trail and comparing alternative audit software are new and provide meaningful supplements to the text.

The fifth section covers service centers and staff training and adds a new chapter on minicomputer and microcomputer systems that is based primarily on AICPA minicomputer control materials.

In summary, the second edition provides a long-overdue update of the general EDP knowledge required of all auditors. This reviewer does not have any disagreement with the material presented. The book could serve as a supplemental reference source in an EDP audit course, but its use in collegiate curricula is limited because it lacks sufficient introductory material for first-level courses and the detail required for advanced courses. The reviewer's greatest concern, however, is the omission of materials on the significant advances in distributed processing technology, plus utilization of spreadsheets, audit packages, and other microcomputer advances that occurred in the early 1980s prior to its publication.

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LARRY J. DUFF, *Audit and Control of Distributed Data Processing Systems* (Altamonte Springs, FL: The Institute of Internal Auditors, Inc., 1983, pp. xi, 131, $33.00 paper).

Duff reports on distributed data processing (DDP) systems combining the results of a survey of 500 organizations with other current research. Topics addressed include a brief history of DDP, various hardware devices and configurations, and audit considerations. The information is intended to meet the needs expressed by the internal auditors of the organizations surveyed, including the need for an understanding of communications networks and systems designs as well as hardware and software appropriate for DDP systems. As such, it also may be useful to practitioners performing independent audits on this type of complex system, and to academicians and their advanced, EDP, or internal auditing classes for reference or supplementary reading purposes. The significance of the information is obvious from the results of the survey, which indicate that 86 percent of the respondents either already had or were installing DDP systems.

The report is divided into five chapters. The first provides background on the research and develops a useful history of the progression of computer systems up through today's complex level. Chapter 2 is technical reading on hardware, software, and organization and communication configurations. The presentation is made more difficult by the use of very computer-specific terminology. Although the author does present some useful definitions, the inclusion of a glossary would be helpful. The effort required to understand this material is probably justified.

The last three chapters are audit-oriented. They begin by addressing topics of organizational control. The focus is on DDP and the author appropriately addresses the location of files, input and output devices, and centralized versus decentralized control procedures. Chapter 4 discusses many topics with which auditors are familiar, such as separation of duties, supervision, and system documentation, and indicates how they are best implemented in a DDP system. The final chapter addresses how audit tests must change to be used in a distributed environment. It presents the problems of testing a DDP system and provides practical advice on how the testing can be accomplished. The major weakness here is in the omission of examples of testing applications. Again, although directed primarily to internal auditors, the information presented has a broad usefulness.

In summary, this book must be evaluated from the view of the intended audience: practitioners. It contains material of both a highly specialized, technical nature and an auditing nature. Thus, unless the reader is knowledgeable in the basics of both areas, some of the reading will be difficult. The topics are well selected, comprehensive, and provide good coverage of DDP systems.

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ADOLF J. H. ENTHOVEN, Editor, *Current Cost Accounting: Its Aspects and Impacts*, International Accounting Research Study No. 4 (Richardson, TX: Center for International Accounting Development: The University of Texas at Dallas, 1983, pp. iv, 111, $8.00 paper).

This monograph is a collection of 14 papers and commentaries on accounting for changing prices, with particular emphasis on current cost accounting. The papers and commentaries were presented at a one-day conference in April 1983 by a group of nationally and internationally recognized accounting practitioners, standard-setters, and educators. Papers included in the monograph were written by R. T. Sprouse (FASB), J. J. Corboy (Dresser Industries), N. M. Bedford (Univ. of Illinois), A. R. Wyatt (Arthur Andersen), R. C. Pearson (Texas Instruments), R. C. Spinosa Cattela (N. V. Philips), F. A. Allardyce (American Standard), C. T. Horngren (Stanford University), A. J. Bindenga (Univ. of Amsterdam), M. C. Mouid (The World Bank), J. C. Burton (Columbia Univ.), A. J. H. Enthoven (Univ. of Texas, Dallas), and T. J. Schiro (International Federation of Accountants). The paper by Schiro discusses the formation, organization, and activities of the International Federation of Accountants. The theme of most of the remaining papers centers around either (1) supporting or opposing current cost accounting or other systems used to account for changing prices, or (2) describing technical or application issues of current cost accounting or other systems used to account for changing prices. The papers are organized into three groups within the monograph: (1) financial accounting issues; (2) managerial accounting issues; and (3) economic, social, and international aspects of current cost accounting.

One of the papers on financial accounting issues provides the historical background leading to FASB Statement No. 33. Several of the papers in this group discuss technical and application issues of accounting for changing prices. Some of the papers provide excellent comparisons and contrasts between United States and United Kingdom efforts to account for changing prices. Although both support for and opposition to attempts to account for changing prices appear in the papers on financial accounting issues, the majority opinion about such attempts seems unfavorable. Opposition to constant dollar accounting is especially noticeable. In addition, some concern is expressed about the audit issues of current cost accounting.

Papers within the group on managerial accounting issues focus on accounting for changing prices from a management perspective. One of the papers describes an application of current value accounting in a specific corporate setting and discusses it as a management information system. Other papers also consider the management information issue; they argue that unless the historical cost system is adjusted for changing prices, it has serious deficiencies as a management information system. Another suggestion is that more emphasis be placed on existing budgeting systems when accounting for changing prices is considered.

The papers on economic, social, and international aspects of current cost accounting generally favor accounting for changing prices. The need for an acceptable international standard for current cost accounting is mentioned. Support is given for the FASB's efforts to date, and improved communication and education in the use of data adjusted for price changes is suggested.

Overall, the monograph offers a set of papers addressing many of the issues associated with the debate on accounting for changing prices. For the most part, the papers are not long and are clear about the points the authors intend to stress. The monograph would be interesting reading for those who have more than a passing interest in accounting for changing prices and might be considered for possible use in a graduate seminar in which accounting for changing prices is being addressed.

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JAMES F. GAERTNER, Editor, *Selected Papers from the Charles Waldo Haskins Accounting History Seminars*, Monograph No. 4 (Atlanta: The Academy of Accounting Historians, 1983, pp. iv, 172, $15.00 paper).

This reviewer read the nine papers included in the monograph before reading the Preface, where one would expect to discern the common thread(s) that unite the papers into a cogent unit. This was done to seek those common threads from the collection itself, rather than be led by the preconditioning influence of the Editor's comments on the purpose of the monograph. This procedure yielded several generalizable observations about the papers in the collection.

First, each paper was well written, making the reading enjoyable, as opposed to the rather heavy going that is characteristic of so much technical writing in accounting. Second, the papers reflected the variety of academic styles (and personalities) of the contributing authors. For example, Professor B. Yamey's introductory paper contains a substantial dose of his personal feelings about the place of history in the scholarly approach to the study of accounting, while Professor R. E. Jensen's discussion of that "Tin Lizzie," the historic cost model, makes clear his personal views concerning accounting's ability to effect changes in the business environment, particularly in the area of social change.

Third, and perhaps more fundamentally, the common theme of all nine pieces appears to be the ongoing, dynamic relationship between the development of accounting theory and related principles with the prevailing business environment of the time. Some of the authors concentrate on the impact of the business environment on the development of accounting theory; for example, Professor R. P. Brief's account of the Cooper-Welton debate and of the relationship of the need for interim income determination to provide a basis for interim dividends, prior to the conclusion of a venture. Also, both Professor D. L. Crumbley's comprehensive treatment of the impact of the U.S. Income Tax on the development of accounting principles in the U.S. and Professor M. C. Miller's discussion of the impact of government regulation on financial accounting in Australia focus on environmental influences of regulation in the two countries.

The theme that the business environment has in the past exercised considerable influence upon the development of accounting theory is eloquently summarized in Professor W. T. Baxter's paper, which does an excellent job of capsulating accounting history over an enormous span of time (from the beginnings of recorded history to the present). Professor H. M. Schoenfeld also attempts to summarize the numerous, diverse influences that have operated through history and in a variety of patriate circumstances to influence the development of accounting theory in various countries; this herculean task, while almost impossible within the confines of a single volume, still provides the reader with a sense of the richness of the insights that are available from a study of the development of accounting principles from an international, historical perspective.

Finally, the idea that accounting is useful to allow people to exercise influence over their environment (and has in fact been used for this purpose through history) is presented in Professor Jensen's paper as well as Professor L. J. Seidler's reference to Lenin's views on accounting and control as a useful tool in the development and management of a socialistic state.

My conclusion (more accurately my "feeling") is that the monograph presents a broad range of well-written pieces, each showing in its own way that the process of accounting theory development has been, and is, a dynamic process that hinges upon the relationship of the discipline to its environment. Two propositions emerge: one, that as the environment changes, so does the discipline and, two, as the discipline changes, so does the environment. An appreciation of the reciprocal relationship is perhaps the most significant offering of this monograph.

Having reached this conclusion, the Preface was read to find what Professor Gaertner had intended to do with the monograph. It was pleasing to note that the reactions reported above parallel the views of Mr. Haskins who "appeared to believe that history, when viewed as an extension of experience, led to greater sophistication which would enable accountants to better understand the public events, social demands and trends of their own times" (p. 2). Hence, the monograph should "have a broad appeal, and . . . expose the reader to the historical dimension of several areas of accounting" (p. 4).

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JOE BEN HOYLE, *Advanced Accounting (Plano, TX: Business Publications, Inc., 1984, pp. xvi, 722, $29.95).*

With 15 chapters and 722 pages, this book is shorter than most leading advanced texts that typically contain 21 chapters and approximately 900 to 950 pages. This can be attributed in part to the omission of some topics that usually are included; these are:

- An historical perspective on business combinations
- Corporate insolvency, liquidation, and reorganization
- Estates and trusts
- Installment sales.

This text devotes seven chapters to corporate investments in affiliated companies and consolidated statements; a chapter each to branch and consignment accounting, foreign currency translation, and segment reporting; two chapters to partnership rather than the normal three; and three chapters to accounting for nonprofit organizations.

Several specific procedures used in the consolidations chapters may be troublesome to instructors having distinct preferences for acceptable alternatives; these include:

- Three methods of accounting for investments in subsidiaries and the related consolidation entries (equity, cost, and modified equity) are covered concurrently. Some texts concentrate on the equity method and cover alternative methods in an appendix.
- Three-division consolidated work papers (income statement, statement of retained earnings, and balance sheet) are used rather than trial balance (debit and credit) type.
- Intercompany profits on asset transfers are prorated between majority and minority interests on upstream transfers. Fractional elimination is not discussed and 100 percent elimination against majority interest for all intercompany profits is not illustrated.
- Gains and losses on intercompany-held bonds that are considered constructively retired are attributed entirely to the parent. Professor Hoyle discusses other alternatives but does not illustrate them. Other leading texts appear to be evenly split between attributing such gains or losses to the issuing affiliate and to prorating them to the purchasing and issuing affiliate on the basis of the difference between face and carrying value.
- The excess of cost above par value of intercompany-held preferred stock having attributes of debt and call premiums relating to outside preferred interests are allocated first to paid-in-capital and when this is zero, to the *subsidiary's* retained earnings. Other leading texts allocate the excess of cost above par first to the parent's other contributed capital and then to the *parent's* retained

earnings. Generally only call premiums are eliminated against the subsidiary's retained earnings.

- The excess of cost above book value for preferred stock having attributes of equity is allocated to assets in about the same way as if it were common stock interests. This is demonstrated with an issue of fully participating preferred stock.
- Subsidiary transactions in its stock are treated as adjustments of the book value of the investment account and the parent's additional paid-in-capital, a position formerly supported by the SEC. An alternative method treats the transaction either as an additional investment or as a sale giving rise to a gain or loss. Professor Hoyle briefly acknowledges this alternative but dismisses it as "a questionable practice." Early in 1983, the SEC reversed its stand and accepted the alternative.

While most of the above alternatives are acceptable currently under GAAP, this is not likely to be the case when the FASB concludes its agenda on consolidated financial statements.

From a pedagogical viewpoint, the organization of the business combinations chapters and the timing and nature of presentation may be troublesome for some instructors; the following are among the specific points that were noted:

- Presentations that introduce a topic or concept may be made unduly complex and confusing to the student by the premature introduction of items that, on the basis of relevance or logic, should be covered later. For example, Chapter 1 goes directly into a comprehensive discussion of the equity method of accounting for investments including consideration of reporting investee income from other than continuing operations, inventory profits (both upstream and downstream), deferred income taxes, and piecemeal acquisitions. All of these complications occur after the initial acquisition and can be introduced and discussed more effectively in later chapters that deal with post-acquisition consolidated reports and intercompany transactions.

Similarly, in Chapter 2 the examples to illustrate the purchase method for mergers and the concepts of excess of cost over book value and a bargain purchase are made more complicated by having the consideration involved in the purchase (in Example 3, p. 54) include stock issue costs. The concepts of the difference between purchase price of the net assets and the purchased book value are independent of the nature and type of the consideration in the transaction and should not be combined in the first exposure.

- The illustrations should include equity method entries for the parent's books along with the elimination entries in the consolidated working paper.

Consolidated working paper eliminations are shown to be coordinated with amounts in the parent's investment account. But the entire discussion of the equity method was in Chapter 1, and students could have trouble recalling what was entered in the parent's books and how and why it was entered. A technique used by some texts to highlight and distinguish the consolidated working paper entries throughout the text is to show the entries made by the parent immediately before each new set of consolidated working paper entries.

- In the consolidated working papers, a single compound entry is made to eliminate the investment account and to allocate the excess of cost or the bargain purchase to assets.

Pedagogically it is useful to separate this into two entries: (1) to eliminate the investment against the subsidiary equity and (2) to allocate the difference between the investment account and the book value of the equity to assets and liabilities. This is useful not only to demonstrate the process of adjusting balance sheet values, but also to facilitate the preparation of amortization schedules and entries in years subsequent to acquisition.

- The sequencing of some material does not contribute to the continuity of instruction or the logical development of some topics.

For example, Chapter 4, Consolidated Financial Statements—Minority Interest, is largely a collection of unrelated topics. It begins with a substantial (11-page) well organized and written discussion of different theoretical perspectives of consolidation (i.e., proprietary, entity, and parent theories). This probably would be more effective if it were moved to a capstone chapter on consolidations to be covered after the student has learned the concepts and procedures of the parent perspective. Students then would have a better foundation for assessing the different theories.

The second section of Chapter 4 presents a comprehensive treatment of the calculation of minority interests under different conditions such as step by step acquisition and interim acquisitions. This material would be more effective if it were redistributed and presented in the chapter where the related condition or topic is discussed.

The third section discusses sales of subsidiary stock by the parent. Many leading texts devote a separate chapter to changes in the parent's equity that arise from open market transactions by the parent and from a subsidiary's transactions in its own stock. The issue here is not so much minority interest as it is recognition of the effects of the equity method on the parent and the parent's perspective in the consolidated financial statements. Usually this material is presented later after covering bonds and preferred stock. Some schools offer a compressed coverage of consolidations that omits this material or gives it cursory treatment.

Chapters of the book dealing with topics other than consolidated financial reports appear to be similar in standard content and presentation to other leading advanced texts, and to be well developed and written. The inclusion of segment reporting in this text is questionable since this usually is covered now in intermediate texts.

The strong points of the text are the refreshing, conversational writing style of the author and the inclusion of comprehensive problems with solutions at the end of each chapter, both of which will be appealing to students. Each chapter has an abundance of good problem material.

In summary, the educational quality of the book is varied, as might be expected in a first edition. Parts of the book are well written and organized, while in others the organization and pedagogy need improvement.

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RAYMOND J. LIPAY, *Understand Those Financial Reports: Question-and-Answer Guide for Investors and Nonfinancial Managers* (New York: John Wiley and Sons, 1984, pp. x, 266, $19.95).

The purpose of this book is to provide information which will help investors and nonfinancial managers understand financial reports. A question-and-answer format is used to enable readers to appreciate and comprehend financial statements, related notes, and other supplementary financial information contained in financial reports.

An informative series of questions and answers deals with audit reports and conditions under which a particular audit report would be rendered. Also of interest to investors and nonfinancial managers is a discussion of the financial reports filed with the Securities and Exchange Commission and how these reports differ from those issued to stockholders.

The book contains illustrations of financial statements, related notes, supplementary financial information, and audit reports taken from well-known corporations. It also contains a glossary of terms that might be helpful to a reader of financial reports.

This book would be useful to its intended audience of investors and nonfinancial managers. Also, the book would be a useful supplement in an M.B.A. financial accounting course in which the students have a non-business background and are receiving their first exposure to accounting and financial reporting.

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ROBERT K. MAUTZ, ALAN G. MERTEN, and DENNIS G. SEVERANCE, *Senior Management Control of Computer-Based Information Systems* (Morristown, NJ: Financial Executives Research Foundation, 1983, pp. xi, 144, $4.50 paper).

R. K. MAUTZ AND JAMES WINJUM, *Criteria for Management Control Systems* (Morristown, NJ: Financial Executives Research Foundation, 1981, pp. vii, 87, $3.50 paper).

As businesses increase their dependence on computers, effective management and control of computer resources becomes an increasing concern. The monographs reviewed here are the second and third in a series of publications that examine internal control.

The first study by three of these and other authors, *Internal Control in U.S. Corporations: The State of the Art* (reviewed April 1981, pp. 434–435), reported on a questionnaire and interview study that identified the current state of the art; the increasing dependence on computers was identified by executives as the aspect of internal control that was most troublesome.

The second publication, *Criteria for Management Control Systems*, presents an excellent discussion of the many meanings of the term internal control, and develops a set of (conceptual) evaluation criteria. This text should be required reading for anyone who teaches "control." *Senior Management Control of Computer-Based Information Systems* concludes the series by examining control in the setting of computer-based information systems. It is based on interviews with top executives of 12 companies, two public accounting firms, and two computer vendors. It provides a tool to improve control over computer-based information systems by presenting evaluation criteria and an extensive list of control practices that have proven useful in a sample of successful, major companies. The monograph is both descriptive and prescriptive. It is descriptive because it presents in detail current practices and viewpoints. It is prescriptive in that the selected companies were judged to be well in control of their information systems.

From an academic point of view, the research method used in the third study is loose. Sixteen firms hardly constitute a statistically representative sample, and the authors provide few clues about what qualified a company as "being in control." But it would be unwise to reject this study for these reasons, because the in-depth analysis has uncovered a veritable gold-mine of information that otherwise would have been ignored.

The third study dramatically demonstrates the recurring *lack of communication* among those who interact with the information system. It is enlightening to read how the "chief information officer" views his position, his problems and responsibilities, and how differently he is viewed by those who use the information system. The monograph makes a major contribution by serving as a mediator that shows "the other side of the table" to those who must interact, more or less grudgingly, with the information system. The authors also provide an insightful analysis of the problems that *underlie* such symptoms as high information systems staff turnover, and a rapidly increasing systems budget.

Both the second and third monographs provide valuable reading for both educators and researchers and would serve well as supplemental texts in a control course. The third monograph would be particularly useful to address the behavioral aspect of control, and its detailed descriptions of current practices and problems constitute a much-needed practical reference point for research in the area of control.

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D. D. RAIBORN, *Audit Problems Encountered in Small Business Engagements,* Audit Research Monograph No. 5 (New York: American Institute of Certified Public Accountants, 1982, pp. xiv, 109, $9.00 paper).

This book is the fifth in a series of research monographs published by the AICPA's Auditing Standards Division. It fits well into the Auditing Research Monograph (ARM) series, the purpose of which is to provide background material and informed discussion that should help in reaching decisions on significant auditing problems. Undoubtedly, ARM No. 5 focuses on an issue that is critical to the auditing profession; namely, whether present auditing standards provide adequate guidance for auditing small business clients. The research findings are particularly valuable considering the paucity of empirical evidence on audit problems in the small business area.

The author attempted to identify small business audit problems by reviewing relevant literature and letters submitted to the AICPA and by interviewing CPAs, including members of the AICPA task force on Review of Existing Auditing Standards. Empirical data were gathered by mailing a four-part questionnaire on small business audit problems and approaches to a sample of 1,475 practice offices in the United States. The sample was selected from a population of 29,500 practice offices as listed by the AICPA data base for mailing of SAS exposure drafts. The response rate was 51.6 percent and 36.8 percent were usable.

The monograph contains seven chapters and seven appendices. Chapters 1 through 3 provide an overview of the study, define "small business," and discuss potential small business audit problems as identified in the literature search and interviews. Chapters 4 through 6 present the research method and results, including findings as to the frequency and perceived importance of various small business audit problems. In addition, relationships between audit problems and client/CPA firm characteristics are reported. Chapter 7 presents the author's conclusions and recommendations for additional guidance in several audit areas.

The author identifies 14 significant audit problems confronting small business auditors. These are further grouped into six areas: internal accounting control, owner-manager controls, uncertainties about analytical review procedures, management representations, inadequate response from the client's legal counsel, and assignment of audit personnel. The author defends the research effort by citing several significant findings. Some of the findings could be expected considering the source of the responses. For example, the respondents do not believe they encounter situations that impair their independence. Other findings are surprising and may convey portentous signals to the auditing profession. For instance, over 66 percent of the CPAs stated that they would perform compliance tests of internal controls even though they could not rely on those controls.

The author concludes by reiterating each of the identified audit problems and assessing the adequacy of guidance in each area as provided by existing auditing standards. In each area, the conclusion is that additional guidance is needed to alleviate the audit problems. For example, clarifying definitions of and relationships between compliance and substantive tests are suggested to alleviate misuse of compliance tests. However, the study could have better met its objective of offering implementation guidelines if specific language for revised definitions or interpretative guidance had been proposed.

While ARM No.5 provides interesting insights for both practitioners and academics who are interested in auditing, a few criticisms are warranted. Some academicians may minimize the authenticity of the findings because of the questionnaire survey approach. Moreover, the author seems to place too much blame for audit problems on auditing standards and too little on practitioners who improperly apply the standards. For example, AU sec. 320.55 clearly states that compliance tests are not necessary unless the procedures are to be relied upon to alter the nature, timing, or extent of substantive tests. Yet, the author calls for "further guidance" and "clarification" to aid CPAs who "misunderstand" the purpose and application of compliance tests (p. 76).

Despite these criticisms, ARM No. 5 is highly recommended as a supplement for graduate auditing classes. Regardless of whether one agrees with the author's recommendations, the monograph offers stimulating reading for anyone wishing to take a critical look at existing auditing standards. Chapter 7, in particular, provides a forum for discussion as to the adequacy of our present standards. While the work may fall short in presenting solutions, the identification of significant problem areas in small business audits is a valuable contribution to auditing literature.

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PHILLIP SAWICKI, Editor, *Income Tax Compliance: A Report of the ABA Section of Taxation Invitational Conference on Income Tax Compliance* (Reston, VA: American Bar Association, 1983, pp. ix, 485, $50.00 paper).

Income tax noncompliance (that is, income tax evasion) is "in"! Whether it takes the form of an "abusive" tax shelter, the overstating of itemized deductions, or the under-reporting of gross income, large numbers of individual taxpayers apparently are evading rather than avoiding the income tax. In an attempt to put into perspective both the problem of noncompliance with the income tax law and possible solutions to that problem, the American Bar Association (ABA) Section on Taxation (which is similar in structure and activity to the recently reorganized AICPA Federal Tax Division) sponsored a conference of attorneys, certified public accountants, economists, political scientists, sociologists, and criminologists to review the problem of income tax noncompliance and the current research of social scientists on that problem.

The book contains 14 lengthy papers that were commissioned for the conference along with shorter papers by conference participants and selected transcripts of oral statements made by conference participants. The commissioned papers deal with the extent and growth of noncompliance, the results of previous studies of taxpayer compliance, opportunities for strengthening the traditional methods used to effect compliance, innovative alternatives to those traditional methods, and the option of imposing value-added or consumption taxes insofar as they are allegedly more difficult to evade. The shorter papers and selected transcripts address a variety of issues related to the commissioned papers and the general problem of noncompliance. Also included are a very short bibliography and a brief but useful index. Actually the well-documented, commissioned papers are a richer bibliographic source than that which the editor provides at the end of the book.

The participants considered two general approaches to mitigating the noncompliance problem. One approach, which might be characterized as improving the enforcement of the income tax system, would rely on either broadening the scope of withholding to encompass income other than compensation or imposing a more easily enforced tax, such as the value-added or consumption tax, along with improvements in the audit-selection process. The other approach, which could be categorized as "tax reform," would seek to improve the taxpayer's attitudes toward the fairness of the income tax system by abrogating selected exclusions, deductions, and credits which allow those with significant levels of income and wealth to pay little or no tax. The conference participants were not enamored with the so-called flat-rate tax proposals that rely on a broad base (i.e., elimination of exclusions and most nonbusiness deductions) and a low progressive tax rate structure (i.e., with 30 percent or less as the highest marginal rate). As one might expect, the participants did not achieve a consensus on the best solution to the problem of income tax noncompliance because of the paucity of research on the issue. But the ABA and the American Bar Foundation announced during the conference that they were planning to fund a three-year study, which should result in sufficient research on and understanding of the problem so that a consensus on its solution may be achieved. No doubt many of the conference participants will contribute to the three-year study.

The list of over 100 participants included only two accounting academics, and the number of participants from the legal profession, the economics profession, and the public sector (i.e., IRS, other Federal agencies, and Congress) far outnumbered the participants from the accounting profession. The author of only one of the 14 commissioned papers had an accounting background and his experience was with the IRS. What does this absence of participation mean? The answer probably is that our profession (whether in academe or public accounting) has just not initiated much research on the problem of noncompliance. Obviously the IRS and those in economics (especially public finance) have a headstart on the accounting profession in investigating the noncompliance problem.

Insofar as doctoral programs in tax accounting have emerged only in the past decade, the development of tax accounting academic research is in its infancy. Although a somewhat generic federal tax database is now available through the sponsorship of Arthur Young and the University of Michigan, the richest source of data for studies of noncompliance remains "locked up" in the IRS computer system.

Tax accounting doctoral students, as well as research-oriented tax accounting academics and professionals, should find this book invaluable in determining the state of the art for the scientific study of income tax noncompliance in the U.S. and other developed, capitalist countries. The papers are well-documented and use or review a variety of research methods. The book certainly would be useful in a seminar for tax accounting doctoral candidates. It also might be useful in a graduate course on tax policy which is offered by a few master's programs in taxation. At a minimum, this book should be ordered by your university or college library as it is an excellent, up-to-date reference work.

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Eldon L. Schafer, Dwight J. Zulauf, and Carol J. Olson, *Practical Financial Management for Dental Practice Administration* (Denver: Center for Research in Ambulatory Health Care Administration, 1983; Vol I: "To the Doctor: Overview of a Financial Information System," pp. xii, 86; Vol. II: "Chart of Accounts for Dental Practices," pp. xii, 121; Vol III: "Cost Accounting," pp. xii, 55; Vol. IV: "Financial Planning and Control," pp. xv, 148; The Four-Volume Set, $65.00 paper).

In this four-volume set the authors recognize the significant transformation taking place in the health-care environment. They address directly the issue that it is now more common for dentists to be involved in the day to day management of their dental practice than it was two decades ago.

Unfortunately, dental schools do not train dentists to cope with the increasing need for accounting information that is useful for both outside reporting and managerial purposes. Volume I addresses this issue directly. It provides the dentist with an overview of financial accounting and the objectives of a financial information system designed for a dental practice.

In Volume II the authors provide guidelines for developing a common structure for accumulating accounting information useful in different types of dental practice. They present a flexible chart of accounts, and introduce the differences between accrual and cash accounting.

As the federal government moves further into implementing prospective pricing for hospitals, it is not too difficult to assume that medical and dental payment arrangements also will change. If so, the chart of accounts will make financial information comparable and useful for price-setting.

Volume III reviews traditional topics of cost accounting. The authors recognize that reliable systems for dental practices are in the early stages of development. They illustrate several techniques of cost allocation and present material that could be used for formulating general cost estimates. A detailed example is presented which walks the reader from the point in which responsibility centers are identified to the determination of full cost of various procedures.

In Volume IV the authors show that the budget is the most important instrument for planning and controlling operations. This concept is very innovative for a dental practice, and undoubtedly makes this volume a unique contribution to the field. The exhibits are very good, particularly those on goal-setting that will help practitioners in identifying priorities.

One difficulty with this volume is that the ways shown for formalizing the planning and controlling functions are more relevant to a group practice than to a sole practitioner.

This four-volume set is an innovative contribution to the financial management of dental practices. In general, the style is clear and appealing to the health-care practitioner. It should be useful to dentists and physicians and to accounting consultants and practitioners with clients in the health-care profession. It also will make an excellent library reference for faculty and students at universities with programs in Health Administration.

OLGA QUINTANA
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G. STEVENSON SMITH, *Accounting for Librarians and Other Not-for-Profit Managers* (Chicago: American Library Association, 1983, pp. ix, 470, $50.00).

This book is intended primarily for librarians who have managerial responsibilities and the need to use financial information. As the author states, professional accountants are not the intended audience. In this reviewer's opinion, other not-for-profit managers also are not served adequately by this book.

The author apparently feels that to use financial information effectively, the librarian-manager must master the mechanics of the accounting process, including those "pesky debits and credits" (pp. 8-43). Hence the book is highly procedural and demands a high level of motivation on the part of the nonaccountant to persist through the accounting cycle. Part I (five chapters) defines the accounting equation and its components, compares different bases of accounting, and introduces budgetary accounting. Part II (six chapters) covers the accounting process for three major funds—the operating fund, endowment fund, and plant fund. Part III (two chapters) presents ratio analysis and recommends procedures for accounting control. Each chapter is followed by exercises, with answers at the back of the book.

Readers of THE ACCOUNTING REVIEW might want to refer to this book if they teach accounting in a library science program or in the library profession's continuing education program. Their adoption of this book would depend largely on whether they agree with the approach that, to drive a car, one has to master automobile mechanics.

Librarians could use some relevant accounting information. For example, libraries that fine patrons the original acquisition cost of a lost book could benefit from a discussion of current replacement cost and its relevance. Those considering user charges for services also might use cost determination techniques. A greater emphasis on managerial decision-making probably would be more appropriate.

Diverse professional groups that manage public and nonprofit organizations in education, health care, and social welfare look to the accounting profession for relevant educational materials. In the absence of a generally accepted common body of knowledge, each author adopts his/her own approach and chooses subject matter with wide discretion. This book is a good example of this state of affairs.

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CAPSULE COMMENTARIES

Harvey S. Hendrickson, Editor

The Commentaries in this issue are by the person indicated.

AMERICAN INSTITUTE OF ACCOUNTANTS *American Institute of Accountants: Library Catalog,* January 1919 (New York: Garland Publishing, Inc., 1982, pp. vi, 237, $25.00).

This reprint lists in 226 pages all of the "books, pamphlets and periodicals, both donated and purchased" (p. 5) that had been collected to January 1919 by what is now The American Institute of Certified Public Accountants. A measure of the astronomical growth in the accounting literature is that this volume is dwarfed by a current quarterly supplement of the *Accountants' Index.* An interesting note is that one of the authors with two entries is William Andrew Paton (coauthor with R. A. Stevenson).

HARVEY S. HENDRICKSON

CLAIRE B. AREVALO, *Effective Writing: A Handbook for Accountants* (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. vi, 154, $13.95).

This book is written by a consultant in written communications and is directed to "the writing problems most frequently encountered by accounting students and practitioners" (p. vi). The presentation is concise, with many illustrations and lists of rules and guidelines. Some 56 of the 154 pages are devoted to questions and exercises with answers given for most of those in the first six chapters. All of the questions in the last five chapters are of the essay/discussion variety with no answers, and most are from CPA examinations, accounting textbooks, or unpublished writing assignments of several accounting professors.

A major disappointment is the continued use of the archaic, inefficient footnote style of reference citations rather than an abbreviated within-the-text style such as that used in the REVIEW.

While not impressive in page size, number of pages, or type size, this book would be very useful as a supplementary text or reference for writing assignments in regular accounting classes, as a self-study writing manual or reference for students and practitioners, and as a quick reference for accounting authors and reviewers.

HARVEY S. HENDRICKSON

F. SEWELL BRAY, *Four Essays in Accounting Theory* and *Some Accounting Terms and Concepts: A Report of a Joint Exploratory Committee of the Institute of Chartered Accountants in England and Wales and the National Institute of Economics and Social Research* (New York: Garland Publishing, Inc., 1982, pp. xxviii, 132, $20.00).

This reprint includes Bray's *Four Essays in Accounting Theory,* 1953 (reviewed April 1954, pp. 339-341) and the 1951 report of a joint committee that was established to study accounting concepts and principles from the perspective of both accountants and economists. Members of the committee included accountants—Bray, Harry Norris, and L. W. Robson, and economists J. R. Hicks, J. E. Meade, and R. Stone.

HARVEY S. HENDRICKSON

RICHARD P. BRIEF, Editor, *Four Classics on the Theory of Double-Entry Bookkeeping* (New York: Garland Publishing, Inc., 1982, pp. xii, 62, $20.00).

This anthology reprints four 19th-century classics on the theory of double-entry bookkeeping that have not been available in most libraries. The authors are Cronhelm, whose piece on the principle of equilibrium is a chapter from his book in double-entry; de Morgan, a mathematician who personified the accounts using what now would be called a matrix approach; Sprague, a well-known

American accountant who much later greatly expanded and revised the piece given here into *The Philosophy of Accounts*; and Cayley, a professor of mathematics who wrote the 20-page book included here.

HARVEY S. HENDRICKSON

R. J. CHAMBERS, *Accounting in Disarray: A Case for Reform of the Law of Company Accounts* (New York: Garland Publishing, Inc., 1982, pp. xii, 243, $25.00).

This is a reprint of a book published in Australia in 1973 under the title *Securities and Obscurities.* It is directed at all who are involved or concerned with the preparation or use of published financial information. Professor Chambers uses examples of obscurant and misleading information from annual reports and the financial and professional press; the opinions of analysts, jurists, and investigators; and proposed remedial amendments to statutes to establish his case for the reform of present laws and accounting practices.

Chambers also indicates that the evidence presented here was the basis for the conclusions presented in his 1966 book, *Accounting Evaluation and Economic Behavior* (reviewed October 1966, pp. 207-208).

HARVEY S. HENDRICKSON

JOHN W. COOK and GARY M. WINKLE, *Auditing,* Third Edition (Boston: Houghton Mifflin and Co., 1984, pp. xiv, 584, $29.95).

This edition adheres to the objectives, style, and organization that characterized the first two editions (reviewed January 1977, pp. 279-280 and January 1981, pp. 210-211). In keeping with prior editions, this is one of the most concise introductory auditing texts available. The authors apparently place a high value on simplicity of presentation and balance between concepts and procedures. This means that the text lacks the depth and rigor of several of its more voluminous competitors.

The only organizational departure from the second edition is the division of the prior chapter on internal control into two chapters—one focusing on system design and the other focusing on the auditor's objectives, reviews, and evaluation of the system. This change is an improvement.

The text is written in the language of the professional literature, an approach that has several advantages as compared to developing a different language or one developed by a major CPA firm as some texts do. Many auditing students intend to sit for the CPA exam and early exposure to "official" terminology can be helpful.

The chapter on audit sampling has been extensively revised and renamed. The chapter reflects the impact of SAS No. 39 although it says very little about non-statistical sampling. The discussion of several popular statistical techniques has been expanded and improved in this edition. Very few changes have been made either in Part III—Audit Objectives and Procedures—or in the end-of-chapter materials throughout the text. The overwhelming majority of the decision problems are adapted CPA examination problems and the selection in this edition does not differ greatly from the second. Supplementary materials are limited to a combined solutions manual/test bank of CPA examination multiple choice questions.

The authors succeed in their objective of adhering to the basics of an initial overview of auditing. This text is a strong contender, particularly in schools that teach on a quarter basis and to those instructors who intend to supplement a basic text with Statements on Auditing Standards, journal articles, computer or research projects, or practice sets.

VAN BALLEW
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CHARLES B. COUCHMAN, *The Balance-Sheet: Its Preparation, Content and Interpretation* (New York: Garland Publishing, Inc., 1982, pp. xvi, 288, $30.00).

This is a reprint of a book published in 1924 by *The Journal of Accountancy,* Incorporated with a foreword by the president of the American Institute of Accountants. It was well-written in a direct, lucid style by a partner in a Missouri public accounting firm who appears to have had an excellent understanding of accounting, largely from the producer perspective. It is a handbook on balance sheet accounting that at the time must have been considered to be normative, that is prescriptive or descriptive of preferable (rather than generally used) accounting practices and principles.

Except for differences in terminology, some sections and chapters continue to be current. For example, much of Chapter IV, Valuation of Assets, probably would be considered largely current by many, including several if not most members of the Financial Accounting Standards Board.

HARVEY S. HENDRICKSON

ARTHUR E. CUTFORTH, *Audits* (New York: Garland Publishing, Inc., 1982, pp. xiv, 151, $20.00).

In this reprint of a book published in London in 1908, Sir Arthur Edwin Cutforth's objective was to produce a small, portable volume that summarizes the duties, principles, and other matters that are of special or vital interest to auditors and that helps students prepare for the auditing paper of the Institute of Chartered Accountants examination. He also included representative questions from prior examinations and their dates, a table of the examiners who "set" the auditing papers for the past ten years, and an index that had three columns of page numbers: one for his book, one for Dicksee's 7th Edition (1892), and one for Pixley's 9th Edition (1881). Thus, in essence this is a study guide for the auditing part of the Chartered Accountant examination with references to more comprehensive books for in-depth study and the non-vital matters that he excluded.

HARVEY S. HENDRICKSON

ARTHUR E. CUTFORTH, *Methods of Amalgamation and the Valuation of Businesses for Amalgamation and Other Purposes* (New York: Garland Publishing, Inc., 1982, pp. xx, 336, $35.00).

This is a reprint of Sir Arthur Cutforth's third edition that was published in London in 1938. The first edition published in 1926 was the first United Kingdom book on amalgamations, a subject that is more commonly referred to in the United States as mergers and consolidations or mergers and acquisitions.

Much of the book is devoted to the question of valuation for amalgamation purposes of which, as the author states, nearly all applies to valuations for other purposes (as indicated by the subtitle).

HARVEY S. HENDRICKSON

R. W. V. DICKERSON, *Accountants and the Law of Negligence* (New York: Garland Publishing, Inc., 1982, pp. xxii, 648, $65.00).

This is a reprint of a comprehensive study of negligence that was published in 1966 by the Canadian Institute of Chartered Accountants (reviewed October 1966, pp. 815-816). Written by a law professor, it is directed to accountants and accounting students, and is a reference work that applies more generally in all Anglo-American jurisdictions than to the law in a specific country.

HARVEY S. HENDRICKSON

HAROLD C. EDEY, *Accounting Queries* (New York: Garland Publishing, Inc., 1982, pp. xviii, 221, $40.00).

This volume presents a collection of Edey's major writings during the 31 years (1949 to 1980) that he was on the faculty of the London School of Economics, and during which he also was a member of several important committees of the Institute of Chartered Accountants, including that on Accounting Standards from its inception in 1970.

The pieces included here are stimulating and insightful. They show early and continuing understanding of financial reporting issues. Edey emphasizes that much of external reporting is directed toward legally-oriented needs rather than the more important decision needs. For the legally-oriented needs and income determination, Edey argues for more standardized rules that reduce judgment of what lies in the future to a minimum. For decision-oriented needs he suggests that accepted management accounting procedures be the basis for determining the best measures and standards for financial accounting. Further, he advocates the development of a cash-flow approach to accounting that would include forecasts.

HARVEY S. HENDRICKSON

SOLOMON FABRICANT, *Studies in Social and Private Accounting* (New York: Garland Publishing, Inc., 1982, pp. x, 286, $40.00).

This volume contains articles and lectures from Fabricant's main writings that were published between 1936 and 1981. The point of view taken is that of an economist interested in developing a set of national accounts and other aggregative measures that would be facilitated by improving the interperiod and interfirm comparability of financial statements. The papers discuss accounting issues and problems that also have been considered in the accounting literature during these 45 years—but usually from a different perspective.

HARVEY S. HENDRICKSON

RICHARD N. FARMER, *Business: A Novel Approach* (Bloomington, IN: Cedarwood Press, 1983, pp. vii, 362, $12.95 paper).

Although this book was written by a professor of international business to be used as a text for an introduction to business course, and had to be published by the author since he could not get it accepted by a commercial house, it has relevance and thus should be of interest to accounting professors, especially those who aspire to be authors. It is a creative attempt to provide a textbook that covers most of the relevant bases, that has many problems, and that has much discussion of what business is about, but that is written as an interesting novel with a plot and a heroine (who has studied accounting). It is enlivened with handwritten notes, sketches, and drawings.

HARVEY S. HENDRICKSON

H. A. FINNEY, *Consolidated Statements: For Holding Company and Subsidiaries* (New York: Garland Publishing, Inc., 1982, pp. xiv, 229, $25.00).

This is a reprint of a volume that was published in 1922 and is claimed by the current publisher to be the first extended treatment of consolidated statements in the United States. It is a highly technical how-to-do-it book with a few exercises and problems and their solutions. Less than two pages are devoted to different views of the "[o]bject of the consolidated balance sheet" (pp. 11–12), and another half-page discusses "[c]onflicting opinions as to the amount of reserve (for the unrealized intercompany profits on inventories)" (p. 104).

HARVEY S. HENDRICKSON

IRVING FISHER, *The Rate of Interest* (New York: Garland Publishing, Inc., 1982, pp. xxxii, 442, $50.00).

This is a reprint of a book published in 1907 and to the "near amazement" of Donald Dewey (who wrote the introduction to the reprint) "this book—the most original and fundamental of [Fisher's] twenty-nine—has been out of print for over sixty years" (p. vii). This book includes the excellent commentary on the history of interest theory that was omitted from his later, better known work (*The Theory of Interest*, 1930). It is this section that sets the stage for showing Fisher's significant contribution: bringing order out of disarray in the debate over the causal factor(s) in the rate of interest. Fisher develops and defends the theory that time preference is the major factor, and also makes a case for using the net present value approach when choosing among investment alternatives.

HARVEY S. HENDRICKSON

SIR GILBERT GARNSEY, *Holding Companies and Their Published Accounts* and *Limitations of a Balance Sheet* (New York: Garland Publishing, Inc., 1982, pp. xii, 232, $25.00).

The first part of this reprint is a book of 208 pages that was published in London in 1923. The author claims in the preface that "[t]his book is, for practical purposes, a reprint of a paper read by me before the London Members of the Institute of Chartered Accountants" (p. ix). Garnsey, a Price Waterhouse partner, is claimed to be the first British writer to discuss the principles of consolidated reporting; his methods were adopted in practice and approved in the Companies Act of 1948.

The second part is a paper presented at the Autumn 1928 meeting of the Institute of Chartered Accountants and included in the Proceedings. It reviews purposes, limitations, criticisms, and prevalent misconceptions of balance sheets.

HARVEY S. HENDRICKSON

CHARLES KEATS, *Magnificent Masquerade: The Strange Case of Dr. Coster and Mr. Musica* (New York: Garland Publishing, Inc., 1982, pp. xviii, 276, $30.00).

This is a reprint of the 1964 biographical novel of the master con man, Philip Musica/William Johnson/Dr. F. Donald Coster (reviewed January 1965, pp. 282–283), who specialized in fictitious inventory swindles. He was head of McKesson & Robbins, Inc. in 1938 when he was exposed after creating over $19 million in fictitious assets. It is stimulating, must reading for any "educated" accountant or auditor.

HARVEY S. HENDRICKSON

WALTER G. KELL and RICHARD E. ZIEGLER, *Modern Auditing*, Second Edition (New York: John Wiley & Sons, 1983, pp. xvii, 706, $28.95).

Numerous changes have been made for this second edition, including: extensive revisions of wording and organization; improved illustration formats; a larger page size; a less readable type;

an update of references to auditing, accounting, and legal pronouncements; and an expanded instructor's manual that includes outlines for both quarter and semester courses, a substantial test bank with many types of questions, and a good supply of transparency masters. Also available, as in the first edition (reviewed January 1981, pp. 220–222), is an excellent student study guide prepared by Professor William Boynton, the book's consulting editor.

Chapter 4 has been substantially reorganized to improve its logical development and readability; a good example of this is the presentation of steps in the method needed to satisfy the second auditing fieldwork standard.

By far the greatest revisions are the substantial changes in the chapters on attribute sampling (Chapter 6) and on sampling in substantive testing (Chapter 11), which were written by William C. Boynton. The new terminology and concepts from SAS No. 39 have formed the basis for an up-to-date discussion of statistical sampling. The probability-proportionate-to-size sampling method (akin to dollar-unit or monetary-unit sampling) is discussed and illustrated extensively before other substantive sampling methods in recognition of its importance in contemporary auditing practice. Also, difference and ratio estimation are given fair treatment, along with the previously favored method, mean-per-unit estimation.

Additions include: short sections within chapters on operational and compliance audits, related-party transactions, and reporting on supplementary information, condensed statements, and selected data; and appendices on standards of operational and internal auditing, tax practice, and management advisory services.

Other changes are more of form than substance; however, an area that needs substantial revision is EDP auditing (Chapter 5), which has not been updated to include the pervasive effects on auditing of microcomputers, telecommunications, and other technological changes.

In summary, revisions made for the second edition of this popular text, although uneven, have corrected most of the weaknesses noted in the review of the first; the professor will find it teachable and the student will find it readable.

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WILLIAM G. OUCHI, *Theory Z: How American Business Can Meet the Japanese Challenge* (Reading, MA: Addison-Wesley Publishing Co., 1981, pp. xii, 283, $12.95).

"Theory Z Management" undoubtedly has been discussed (and discredited) by many persons who have not read this book. This is unfortunate, since this is not a proposal to transplant in America a management style that evolved and succeeded in a very different, foreign social structure, culture, and environment. Instead, the book reports on the findings of some seven years of systematic study of managerial practices in Japanese and American companies by a UCLA business professor who has degrees from Stanford (M.B.A.) and Chicago (Ph.D.) and is a regular consultant to several Fortune 500 companies. The author's initial hypothesis was that the Japanese approach could be found among the American companies. He did find that the basic philosophy of the approach had been developed in several companies, including Dayton-Hudson, Hewlett-Packard, IBM, and Eli Lilly. He also found that one very pervasive and successful aspect of Japanese management had been invented in America (but perfected in Japan): this was the Quality Control Circle (a permanent group of employees who are responsible for one aspect of the production process).

The basic concepts on which this wholistic, humanistic approach is built are trust, subtlety, and intimacy, which expand into developing positive attitudes among executives and employees in their views about each other, the value of their work, group participation, and working together toward common goals. Much of the discussion of the Z approach is reminiscent of Likert's System IV, McGregor's Theory Y, and presentations on profit and product sharing plans and the conditions necessary to make them work.

With its extensive index, the substantial bibliography that emphasizes the classics of management and organization behavior, and numerous examples, explanations, and illustrations, this book would be useful reading for accountants who also are students of management styles and philosophies and for accounting administrators and managers seeking to improve the efficiency and effectiveness of their organizations.

HARVEY S. HENDRICKSON

R. W. PERKS, Editor, *The British Accounting Review: Research Register 1984* (Bangor, Gwynedd, North Wales: The British Accounting Association in association with The Institute of Chartered Accountants in England and Wales, 1984, pp. vii, 238, £5.00).

This small volume presents a listing of 78 universities, polytechnics, and other institutions in the United Kingdom that offer substantial accounting courses—many of which have separate schools or departments. The information given for each of the 71 institutions that provided substantial responses includes name, address, telephone number, names of faculty with their teaching specialties, and status or progress on research interests or projects; many also reported recent publications, staff changes, and other information. Also included are reports from four accounting organizations listing their research in progress at December 31, 1983 with information as to subject, author, objectives, and status. New editions are to be published every two years.

The volume concludes with a 27-page subject index. But it does not include an alphabetical index of faculty members, a feature that would increase its usefulness.

This register would be useful to accounting academicians and researchers not only in the United Kingdom but also in the rest of the English-speaking world. The American Accounting Association should consider preparing a register such as this, preferably in an easily updated and accessed data bank.

Harvey S. Hendrickson

Thomas J. Peters and Robert H. Waterman, Jr., *In Search of Excellence: Lessons from America's Best-Run Companies* (New York: Warner Books, 1982, pp. xxiv, 360, $19.95 cloth, $8.95 paper).

The central assumption in this best-selling book by two management consultants is that those who want to become excellent must emulate the biggest and the best. This assumption probably is a key factor in the minds of many accounting professors who encourage their students to seek out and accept employment offers from "Big Eight" firms.

Although the basic assumption is appealing, since the experience of being a part of and observing an efficient, effective organization would seem to provide useful lessons and guidance for success in the future, emulators would seem destined to failure or serious embarrassment if they have not also learned to adapt to changes in their environment.

This book would provide stimulating supplementary reading for accounting professors, practitioners, and students.

Harvey S. Hendrickson

W. Thomas Porter and William E. Perry, *EDP: Controls and Auditing*, Fourth Edition (Boston: Kent Publishing Co., 1984, pp. xvii, 571, $32.95).

This text uses a good blend of concepts and procedures to describe the auditing process in computerized environments. It represents an improved, hard-bound version of the third edition (reviewed January 1982, pp. 233-234), and is designed for students having introductory-level auditing and EDP backgrounds.

The authors have improved the book by expanding its breadth and depth of coverage. The major improvements include: the incorporation of the concepts of risk and auditor risk assessment (Chapter 4); the addition of a chapter on computer crime, including control and audit recommendations (Chapter 14); and the inclusion of a separate chapter (16) of EDP-auditing questions from recent CPA exams. The material on controls has also been expanded.

Pedagogically, the book provides many learning aids. Each chapter begins with a stated objective and flowchart of the overall EDP audit process with the relevant step highlighted—also, the purpose of the step and specific audit methods are summarized. In addition, many good examples are provided to explain concepts, the exhibits and illustrations are adequate, and the appendices are very good. A glossary is included. A solutions manual is provided but has not been reviewed. Neither an instructor's manual nor a student guide are available.

This book is worthy of consideration as the primary text in a one-semester (quarter) course on EDP auditing and as a supplemental or reference text for introductory and advanced auditing and for information systems courses.

H. James Williams
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Jeremiah J. Sullivan, *Handbook of Accounting Communications* (Reading, MA: Addison-Wesley Publishing Co., 1983, pp. viii, 440, $29.95).

The stated purposes of this handbook are (1) to develop an understanding of the communications behavior of accountants and (2) to build oral and written accounting communication skills (p. v). The author, a professor of business communication with little or no prior knowledge of accounting, obviously has conducted extensive research and learned much about accounting and accountants; only rarely does he use terms or discuss procedures in a way that accountants would consider to be awkward or inappropriate.

This book is unique in its attempt to combine specific problems and needs of accountants with guidelines, strategies, and techniques for improving the effectiveness and efficiency of oral and written communications. It is pleasing to find that he uses a simplified, efficient, within-the-text style for citing references, similar to that used in the REVIEW.

The text is more applied than conceptual in that it emphasizes examples, assertions, case studies, illustrations, strategies, and techniques. The author often seems to avoid basic questions or issues (e.g., nowhere does he directly define "communication"; instead he begins with the goals of accountants' communication, continues with a summarized presentation of the Bedford and Baladouni two-dimension model of the accounting process—observing data and producing information—then describes his model of the accounting communication process (pp. 1-7)). Some of the material overlaps (or reinforces) that taught in basic management and organizational behavior courses.

While this textbook is a monumental work for a first edition, the second edition could be improved with the assistance of discerning accountants who could further enhance its credibility and relevance by helping to revise questions such as: "'Who compiles the age of accounts?' [or] 'Tell me about the reporting process of age of accounts?' " (p. 331).

The distinctive characteristics of this scholarly handbook include its page and type size, its number of pages, its extensive coverage, its substantial bibliography, and its excellent index. It could be used as a text or reference in degree programs or continuing professional education courses in accounting communications, and as a comprehensive reference on communications in regular accounting courses and in offices of accounting researchers, teachers, and practitioners.

HARVEY S. HENDRICKSON

United States of America Before the Securities and Exchange Commission in the Matter of McKesson & Robbins, Inc.: Report on Investigation (New York: Garland Publishing, Inc., 1982, pp. xvi, 501, $50.00).
United States of America Before the Securities and Exchange Commission in the Matter of McKesson & Robbins, Inc.: Testimony of Expert Witnesses (New York: Garland Publishing, Inc., 1982, pp. xvi, 638, $65.00).

These reprints of the 1940 and 1939 U.S. government publications contain (1) the full report of the SEC's investigation of the auditing practices followed by McKesson & Robbins, Inc. and its independent auditors and (2) the testimony of the expert witnesses cross-referenced to the topics of their testimony. These two volumes on this famous case that substantially changed accepted auditing standards are a rich source of historical information about the American accounting profession and accepted accounting and auditing practices of the 1920s and 1930s.

HARVEY S. HENDRICKSON

GLENN A. WELSCH, ROBERT N. ANTHONY, and DANIEL G. SHORT, *Fundamentals of Financial Accounting*, Fourth Edition (Homewood: Richard D. Irwin, Inc., 1984, pp. xix, 874, $27.95).

After using this textbook this reviewer concluded that it has a high probability of achieving the authors' objective of developing students' basic knowledge of financial accounting concepts and the ability to use accounting information for decision-making. It skillfully combines the conceptual and procedural approaches to facilitate the student's learning process.

The new edition develops some important financial concepts better than the third edition. For example, Chapter 10 (covering liabilities) contains an expanded discussion of leases and provides a more complete introduction to the basic leasing issues. The one-half page on this topic in the previous edition was not adequate for this complex area. Another improvement is the increased emphasis on cash flows. This edition emphasizes the Statement of Changes on a cash basis instead of using the working capital basis of older editions.

Although the authors say that approximately 80 percent of the assignment material has been revised, most changes are in the numbers rather than in the structure or conceptual nature of homework material; most of the textual illustrations are the same in the last two editions.

The development of this text indicates that the authors have retained the strengths and attempted to correct weaknesses of earlier editions. For discussions of the strengths and weaknesses of these editions, the reader is referred to their reviews (April 1975, pp. 431–432; January 1978, pp. 301–302; and January 1982, pp. 239–240). One suggestion of earlier reviewers has been alleviated by the inclusion of glossaries of key terms at the end of each chapter.

While this book contains too much material for most one-quarter or one-semester undergraduate courses, it is flexible enough to be used at different levels. This text also may be successful in introducing MBA students to the important financial accounting concepts and in stimulating student discussions.

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STEPHANIE WINSTON, *The Organized Executive—A Program for Productivity: New Ways to Manage Time, Paper, and People* (New York: W. W. Norton and Co., Inc., 1983, pp. xvi, 329, $15.00).

This is the second book on the topic of organizing one's life by the president of a management consulting firm who is a popular lecturer and seminar leader.

The core of the first chapter is a 19-question, self-diagnostic, true-false test with score evaluations and an organizing program that is keyed to later sections of the book.

This well-written, how-to-do-it book with numerous illustrations, examples, tips, and acronyms contains little that is new, but it could be extremely useful as a "gimmick" to help most students and professionals to get organized or to improve the way they organize their working and personal lives and in the process improve their efficiency, effectiveness, and enjoyment of life.

HARVEY S. HENDRICKSON

WILLIAM ZINSSER, *Writing With a Word Processor* (New York: Harper & Row Publishers, 1983, pp. viii, 117, $12.95).

In a narrow sense, one might maintain that the title of this book is a misnomer, that another word is needed for "writing." But a review of available dictionaries indicates that the definition of "writing" already has been extended to include composing and imprinting, so that unless or until greater precision is needed, "writing" appears to be acceptable.

This book is by the author of *On Writing Well* (whose career has included journalism and teaching nonfiction and humor writing). In it he tells an interesting and humorous tale of his experiences while selecting and teaching himself to use a word processor (an IBM Displaywriter). He points out many of the problems he had with the hardware and software, and shows how being able to revise and retype his work instantly on an electronic screen has improved his efficiency as a writer and editor. He also claims that the experience has alleviated his machine phobia. He has become an enthusiastic advocate of the new technology and its potential for improving most aspects of writing and publishing.

This delightful little volume would be useful to any student, researcher, teacher, author, or letter writer who has not begun using a word processor or micro/personal computer.

HARVEY S. HENDRICKSON

BOOKS RECEIVED APRIL 21, 1984 TO JULY 20, 1984

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JANUARY 1985 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The REVIEW *is published on the first day of January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 33583. All replies to box numbers should be on separate sheets to facilitate forwarding. There is no charge for this service to AAA members and associate members seeking employment. Others will be charged a fee of $100 per insertion. Ads should not exceed 100 words.*

#101 CARNEGIE-MELLON UNIVERSITY—The School of Urban and Public Affairs is searching for Assistant Professors to teach accounting, information systems, and finance in graduate programs. Individuals should have the potential for excellence in research and training in the disciplines of information systems or finance, and accounting, economics, mathematics, and statistics. Applicants should submit a current vitae and evidence of research such as publications, working papers, or dissertation proposal and chapters to: Professor Rajiv Banker, School of Urban and Public Affairs, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213. Carnegie-Mellon University is an equal opportunity/affirmative action employer.

#102 POSITION WANTED: B.S. ('77) and M.S. ('83) in Accounting from University of Virginia, successful completion of C.P.A. examination ('77), J.D. ('80), with over four years experience practicing law in the fields of tax, corporate, and finance. Have taught undergraduate accounting at University of Virginia. Seek full-time, tenure-track position teaching business law and/or tax. Write to: 1985 Howard Circle, N.E., Atlanta, GA 30307.

#103 UNIVERSITY OF NEW ORLEANS invites applications for the position of Assistant Professor of Accounting. Candidates should have the Ph.D. or DBA degree. Dedication to excellence in teaching, research, and professional activities is necessary. Salary is negotiable and competitive. The University offers the M.S. in Accounting and the M.S. in Accounting (tax option), as well as the M.B.A. Approximately 700 undergraduate accounting majors are enrolled. The University has AACSB accreditation at both the undergraduate and graduate levels. Candidates should send resumé to Professor R. J. Thacker, Chairman, Department of Accounting, College of Business Administration, University of New Orleans, New Orleans, LA 70148. UNO is an Affirmative Action, Equal Opportunity Employer.

#104 POSITION WANTED: B.Eng., M.B.A., R.I.A., C.M.A. with five years public, three years university teaching and three years college teaching seeks research or teaching position in a Ph.D. university to enable starting Ph.D. Reply Vivek Kalevar, Champlain College, Lennoxville, P. Quebec J1M 2A1, Canada. Residence (819) 564-8601.

#105 EASTERN ILLINOIS UNIVERSITY. Assistant or Associate Professor of Accounting. Tenure-track position. Ph.D. in Business with accounting major required. Teaching load reduction possible for those researching and publishing. Class assignments are flexible (depending upon program needs), but auditing, governmental, and financial are primary needs. Salary is dependent upon qualifications and experience with net pay being very competitive since Eastern is not under Social Security and the pension plan is tax-sheltered. For further information contact: Dean Ted Ivarie, College of Business Administration, Eastern Illinois University, Charleston, IL 61920; (217) 581-3526. An Affirmative Action/Equal Opportunity Employer.

#106 THE UNIVERSITY OF MANITOBA is seeking applicants for tenure-track positions in accounting at the Assistant, Associate, or Full Professor levels for July 1985. Ph.D. (or near completion) is required. Research is encouraged and supported. A Ph.D. program is in the planning stage. Winnipeg, a multi-cultural city of 600,000, offers the best of an urban environment in the heart of Canada's vacation land. Competitive salary. For more information, contact: Dr. Nabil Elias, Chairman, Search Committee, Faculty of Administrative Studies, University of Manitoba, Winnipeg, Canada R3T 2N2; or call collect (204) 474-9783. Both women and men are encouraged to apply. In accordance with immigration requirements, priority will be given to qualified Canadian citizens and permanent residents of Canada.

#107 TULANE UNIVERSITY School of Business is seeking a faculty member in accounting to fill a tenure-track position. While an appointment at the level of assistant professor will be considered, we especially encourage experienced faculty members with substantial teaching experience and established research records to apply for appointment at higher ranks. Salary and benefits are competitive. Please contact Dr. David Harvey, Accounting Group Coordinator, School of Business, Tulane University, New Orleans, LA 70118, telephone: (504) 865-5401. An Equal Opportunity/Affirmative Action Employer.

#108 UNIVERSITY OF MISSOURI—ST. LOUIS has tenure-track positions beginning August, 1985. Rank and salary dependent on qualifications. Most interest areas can be accommodated though candidates in managerial, taxation, or systems preferred. Quality research and teaching expected. Candidates should possess Ph.D./DBA (accounting or taxation) or LLM (taxation). Professional certification desirable. ABD's considered for junior position. Senior appointment requires strong publication record. UMSL enrolls over 3,000 students in AACSB accredited undergraduate and MBA programs. Pleasant suburban location. Send resumé or inquiries to David R. Ganz, Coordinator, Accounting Area, University of Missouri—St. Louis, St. Louis, Missouri 63121 (an affirmative action, equal opportunity institution).

#109 CALIFORNIA STATE UNIVERSITY, SACRAMENTO has accounting faculty openings, effective February/September 1985, in its accredited AACSB undergraduate and master programs. Salary and rank open, commensurate with academic preparation and professional experience. For tenure-track positions, applicants must hold appropriate doctoral degree; professional experience and/or certification are recommended. Applicants in final stages of doctoral study will be considered for nontenure-track positions that may be converted to the tenure track if the doctoral degree requirement is completed during the term of the appointment. For temporary appointments, the applicants must have a master's degree, professional experience and/or certification, and must show serious intentions to pursue the appropriate doctorate degree. Visiting appointments with doctoral degrees or with major preparation and professional accomplishments (temporary one-year employment) may be available as needed. Send application letter and resumé to Dr. Amin Elmallah, Acting Chair, Department of Accountancy, School of Business and Public Administration, California State University, 6000 J Street, Sacramento, CA 95819. Closing date for applications is July 31, 1985, for September 1985 appointments. CSU, Sacramento is an Equal Opportunity/Affirmative Action/Title IX/Vietnam Era Veteran Employer.

#110 SIMON FRASER UNIVERSITY invites applications for tenure-track appointments in Accounting and M.I.S. Rank open. Successful candidates must have strong research and teaching abilities for both undergraduate and graduate courses. Ph.D. in hand or near completion. Be prepared to actively participate in the development of the Faculty. Start date—September 1985 (flexible). Candidates eligible for employment in Canada at time of application are preferred. All positions are subject to budgetary approval. Send curriculum vitae and names of three references to: Appointments Committee, Faculty of Business Administration, Simon Fraser University, Burnaby, B.C., Canada V5A 1S6.

#111 UNIVERSITY OF SASKATCHEWAN, Saskatoon, Canada, invites applications to the Department of Accounting for permanent and visiting appointments effective July 1, 1985. Doctorate complete or near completion required for permanent position, Master's with professional qualifications acceptable for temporary positions. Present accounting faculty complement of fourteen hold Ph.D.'s from Michigan, Michigan State, Minnesota, Missouri, and Washington. Teaching load normally 2-3 courses per term over mid-September to mid-April academic year. Permanent faculty applicants expected to have strong research interests. Inquiries including current resumé should be mailed to Professor W. Daryl Lindsay, Head, Department of Accounting, College of Commerce, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0; phone 306-966-8396.

#112 SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE. Applications are invited for a junior and a senior faculty position in accounting at the assistant, associate or full professor level beginning on September 1, 1985. A Ph.D. or DBA degree is required (ABD will be considered for the assistant professor level). The candidate considered for the senior position must have an established record of outstanding research. The College of Business and Administration is accredited by the AACSB and it has over 600 undergraduate and 40 graduate accounting majors. In addition, the College offers an MBA degree, an M.Acc. degree, and a DBA degree with an Accounting concentration. Salary will be competitive with current market rates dependent upon the candidate's qualifications and experience.

#113 THE DEPARTMENT OF ACCOUNTING AND MANAGEMENT SCIENCE within the School of Business at California State University, Chico, has faculty vacancies at all ranks for tenure-track positions. Candidates must have a Ph.D., D.B.A., or A.B.D. Teaching performance, scholarly productivity, and university service record are essential attributes to appointments at advanced rank. The Department has approximately 400 undergraduate accounting majors and an MBA with an option in Accounting. Both Master's and Baccalaureate programs are AACSB-accredited. CSU-C is located in northern California, with outstanding summer and winter sports activities available. Housing costs in Chico approximate midwestern metropolitan levels. Send resumé to Dr. Lee Pryor, Professor and Chair, Department of Accounting and Management Science, California State University, Chico, 95929-0011. CSU-C is an affirmative action employer.

#114 ACCOUNTING: FURMAN UNIVERSITY. Assistant/Associate Professor, tenure-track, beginning fall 1985. Furman is a church-related liberal arts college with a strong academic tradition. Seek individual to teach auditing and either financial or managerial accounting. Candidate should be dedicated to teaching excellence. Doctorate with professional certification preferred, but MBA with professional certificate and teaching experience will be considered. Salary and fringe benefits are competitive. Send resumé to Dr. Charles L. Alford, Chairman, Department of Economics and Business Administration, Furman University, Greenville, South Carolina 29613. Application deadline: March 1 or until position filled. Furman is an Equal Opportunity, Affirmative Action Employer.

#115 AMERICAN UNIVERSITY, Washington, D.C., has two tenure-track positions for terminally qualified people. One is for MS in Taxation Program. Other for a Ph.D. or DBA with a systems/auditing orientation. Interest in International Accounting desired. Accounting Department has 13 full-time faculty. Good teaching and professional involvement are essential. Salary and benefits competitive. Excellent research and professional opportunities in D.C. Contact: Gary Bulmash, KCBA, American University, Washington, D.C. 20016. EEO/AA.

#116 BALL STATE UNIVERSITY, Muncie, Indiana. A George A. Ball Distinguished Professor of Business will be appointed by the College of Business of Ball State University for one academic year starting September 1, 1985. The College of Business includes the departments of Accounting, Business Education and Office Administration, Economics, Finance, Management Science, and Marketing. Applicants may come from any of the disciplines represented in these departments. The applicant should be an established scholar with a distinguished publication record and a commitment to high-quality teaching who would be willing to encourage research growth of the faculty and improvement of the instructional programs. Application deadline is February 28, 1985, or until a candidate has been identified, whichever occurs later. Application letters and vitae should be sent to Dr. Neil A. Palomba, Dean, College of Business, Ball State University, Muncie, IN 47306. Ball State University Practices Equal Opportunity in Education and Employment.

#117 POSITION WANTED: MAS/CPA, with Big Eight experience, four years teaching at AACSB-accredited department. Taught financial, managerial, cost, and auditing. Excellent student evaluations and strong references. Seek tenure-track position at college emphasizing teaching excellence. Prefer Midwest location but will consider twelve-month appointment elsewhere. Available Summer or Fall 1985.

#118 KANSAS STATE UNIVERSITY seeks applicants for two anticipated positions at the rank of Assistant or Associate Professor. Ph.D., DBA preferred. Doctoral candidates within one year of completion will be considered. Appointment at Associate level requires four or more years of post-doctoral experience and significant publications. Final review of applicants will begin January 15, 1985. Kansas State University, Department of Accounting, Calvin Hall, Manhattan, KS 66506. Affirmative Action, Equal Opportunity Employer.

#119 UNIVERSITY OF CALIFORNIA, DAVIS. Faculty Position in Accounting. One position with rank open in the Graduate School of Administration. Duties include graduate instruction, course development, and a high level of research productivity. Applicants should have research experience or demonstrated potential in at least one of the following areas: managerial accounting, planning and control systems, or accounting information systems. Ph.D. or equivalent is required. Send vita and names and addresses of four references to Gary M. Walton, Dean, Graduate School of Administration, A-2, University of California, Davis 95616. Applicants for Assistant Professor should send graduate transcripts. Position open until filled, but to guarantee consideration applications should be received by January 31, 1985; position available July 1, 1985. The University of California is an Equal Opportunity, Affirmative Action Employer and invites applications from all qualified individuals.

#120 APPLICATIONS FOR POSITIONS IN ACCOUNTING, at all professional ranks, are invited from qualified persons having teaching and research interests in the areas of auditing, financial, health care, information systems, managerial, and public policy. A Ph.D. is required. Demonstrated ability or potential for effective teaching and quality research are important considerations. Also, a vacancy for a full professor with primary interest in financial accounting exists, and the Accounting Department of The Wharton School is actively engaged in recruiting someone to fill this position. The University of Pennsylvania is an equal opportunity/affirmative action employer. Interested persons should send their resumé including educational background, professional experience, publications, personal data, and, if applicable, a dissertation proposal and abstract to: Professor Samuel R. Sapienza, Accounting Department, Suite 2400 Steinberg Hall-Dietrich Hall/CC, University of Pennsylvania, Philadelphia, Pennsylvania 19104.

#121 THE UNIVERSITY OF ARKANSAS invites applications for two tenure-track positions at the assistant professor level beginning Summer or Fall 1985. While our primary teaching needs are in Tax and Systems and anyone joining our faculty must be an effective teacher, we are primarily interested in adding faculty that are qualified and motivated to engage in research that leads to publication. A Ph.D./DBA or doctoral dissertation stage is required. The College of Business Administration has AACSB accreditation for both the undergraduate and graduate programs and administers the only Ph.D. program in the state. Send resumé to: Dr. James Millar, Department of Accounting, College of Business Administration, University of Arkansas, Fayetteville, AR 72701. An equal opportunity/affirmative action employer.

#122 DEPARTMENT HEAD. The University of Arkansas at Fayetteville is searching for a department head for its Accounting Department starting July 1, 1985. This is an opportunity for an individual to shape the department as it continues to emerge as a research and teaching institution. Considerable commitment to this goal exists within the present faculty. An applicant should have a record that demonstrates a commitment to scholarly research, publication, and teaching that will support appointment at the associate or full professor rank. The University of Arkansas at Fayetteville offers the opportunity of association with the flagship campus of the system (and only doctoral degree-granting institution in the state) combined with a small-town environment in the foothills of the Ozark Mountains. The Accounting Department presently has 16 full-time faculty positions, including two chaired professorships. Applications should be sent to Professor James Millar, Search Committee, Department of Accounting, College of Business Administration, University of Arkansas, Fayetteville, AR 72701. An equal opportunity/affirmative action employer.

#123 PORTLAND STATE UNIVERSITY, located in Portland, Oregon, invites applications for a permanent appointment in accounting. The available position is at the Assistant and Associate level. Research and teaching in taxation required. Applicants should possess a doctoral degree in accounting although candidates at an advanced dissertation stage will also be considered. Performance evaluation at PSU is based upon a judicious blend of effective classroom teaching, research and publication, and university and community service. The standard teaching load is nine quarter hours. Programs are offered at both the undergraduate and graduate levels. The department enjoys a very close relationship with the professional accounting community in the state. Vita should be directed to Dr. Richard H. Visse, Head, Department of Accounting, Portland State University, Portland, Oregon 97207. Applications will be accepted until February 28, 1985. PSU is an equal opportunity, affirmative action employer. Qualified minorities, women, and members of other protected groups are encouraged to apply.

#124 DBA, CPA with a research record seeks a senior-level accounting position with a southern university having a balance between teaching and research. Currently tenured associate professor at a large midwestern university.

#125 THE NAVAL POSTGRADUATE SCHOOL anticipates one or two tenure-track openings. Ph.D. candidates or recent graduates with strong research training and graduate teaching interests will be considered for appointment at the assistant professor level. A proven record of research and longer teaching experience will be considered for the associate professor rank. Candidates with primary interests in auditing or financial accounting are especially sought. Substantial research funds are available. Salaries and fringe benefits are competitive. Reply to Professor Willis R. Greer, Jr., Department of Administrative Sciences, Naval Postgraduate School, Monterey, CA 93943. An Equal Opportunity Employer.

#126 THE UNIVERSITY OF WISCONSIN-PLATTEVILLE has a position in the Accounting Department to teach Elementary and an area of specialty, particularly systems and auditing, beginning August 1985. A Master's degree required, but Ph.D. or D.B.A. or Master's with CPA certification and practical experience is preferred. Salary and rank are open, depending on qualifications. Deadline for applications is March 1, 1985. Apply to: Steven A. Becker, Chairman; Department of Accounting; University of Wisconsin-Platteville; Platteville, WI 53818; Telephone: (608) 342-1464. Equal Opportunity/Affirmative Action Employer.

#127 CALIFORNIA STATE UNIVERSITY, LOS ANGELES, anticipates several full-time openings for accounting faculty beginning fall 1985. Candidates with a relevant doctorate will be considered for tenure-track appointment with rank and step depending on qualifications. Candidates with Master's degree only will be considered for a one-year appointment with salary depending on qualifications. This appointment may be extended for an additional year pending fiscal consideration and evaluation. Strongest need is in financial accounting area. In all cases, preference will be given to those with CPA, teaching, and professional experience. Cal State L.A. is an Equal Opportunity/Affirmative Action/Handicapped/Title IX Employer. Applications will be considered until positions are filled. Send resumé and three references to Chair, Department of Accounting, Cal State L.A., Los Angeles, CA 90032.

#128 CLARION UNIVERSITY OF PENNSYLVANIA. One or more tenure-track positions for the 1985-86 academic year. Rank and salary depend on academic preparation and experience. Ph.D. or ABD required for tenure-track appointment. Our program includes a five-year Accountancy Program in addition to baccalaureate curriculum. Send letter of application, vita, three (3) letters of reference and transcripts by February 18, 1985 to: Dr. Charles J. Pineno, Chair, Department of Accountancy, College of Business Administration, Clarion University of Pennsylvania, Clarion, PA 16214. EOE.

#129 UNIVERSITY OF OTAGO, Dunedin—New Zealand. Lecturer or Senior Lecturer in Accounting and Finance. Applications are invited for a teaching position in the Department of Accounting and Finance. The appointment may be made at the Lecturer or Senior Lecturer level. The primary purpose of the lectureship is to share in the teaching of the courses offered at undergraduate, postgraduate and post-experience levels in accounting and finance and to contribute to research in these areas. *Salary:* Lecturer—NZ$21,660-NZ$25,684 per annum. Senior Lecturer—NZ$27,088-NZ$34,387 per annum, with a bar at NZ$30,127 per annum plus a cost of living allowance of NZ$417 per annum. Further particulars are available from the Secretary-General, Association of Commonwealth Universities (Appointments), 36 Gordon Square, London WC1H OPF, or from D.W. Girvan, Registrar, P.O. Box 56, Dunedin, New Zealand. Applications quoting reference number A84/43 should be forwarded to D.W. Girvan, Registrar, as soon as possible.

#130 SOUTHWESTERN UNIVERSITY seeks applications for an appointment at the Assistant or Associate Professor level of Accounting. Applicants should hold the Ph.D. or D.B.A. degree or be in the doctoral dissertation stage, and should be qualified to teach a variety of undergraduate accounting courses including auditing. Southwestern is an undergraduate liberal arts institution related to the United Methodist Church; has an academically well-prepared student body and substantial endowment. Contact G. Benjamin Oliver, Dean, Brown College of Arts and Sciences, Southwestern University, Georgetown, Texas 78626. An Equal Opportunity/Affirmative Action Employer.

#131 FLORIDA ATLANTIC UNIVERSITY invites applicants for three accounting faculty positions for Fall 1985. All are tenure-track positions for which a Ph.D. or D.B.A. in accounting is desired. A.B.D.'s will be considered. Rank and salary for these positions will depend on qualifications. FAU, located in Boca Raton, offers undergraduate accounting, Master of Accounting and an M.B.A. program. Contact: Carl Dennler, Jr., Director, School of Accounting, Florida Atlantic University, Boca Raton, Florida 33431.

#132 CALIFORNIA STATE UNIVERSITY, NORTHRIDGE (situated in the northwest corner of the City of Los Angeles), anticipates full-time faculty openings at the ranks of Professor, Associate Professor, and Lecturer for the academic year 1985–86. The Department offers BS and MS degree options in both Accounting Theory and Practice and MIS. Doctorate in Accounting required for tenure and promotion. CPA or CMA certificate desired. Salary level $20,148-$38,664, commensurate with qualifications and experience. We are an equal opportunity, affirmative action, Title IX, Section 504 employer. Address inquiries to: Donald L. Raun, Department Chairman, Department of Accounting and MIS, School of Business, CSUN, Northridge, CA 91330. Application deadline: January 15, 1985, or until positions are filled.

#133 CHAIR—THE DEPARTMENT OF ACCOUNTING AT TEXAS CHRISTIAN UNIVERSITY is seeking to fill the Robert and Maria Lowdon Chair of Business Administration. Candidates should have a distinguished record of scholarly research and high quality teaching. (A permanent or visiting appointment can be considered.) TCU is a well endowed, private university of approximately 6,000 students. The M.J. Neeley School of Business is completing an endowment fund raising campaign of over 10 million dollars. In addition plans are now in progress to renovate and add to the school's current building. The department offers bachelor's and Master's degrees. There are seven tenure-track faculty members, with additional members to be added over the next few years. Salary, fringe benefits, and teaching load are very competitive. Research support is excellent. TCU is located in Forth Worth, Texas, a thriving, extremely livable sunbelt city with a lower than average cost of living. Nominations and applications will be accepted until the position is filled. They should be sent to: Donald R. Nichols, Chairman, Department of Accounting, M.J. Neeley School of Business, Texas Christian University, Forth Worth, Texas 76129. TCU is an Equal Opportunity/Affirmative Action Employer.

#134 UNIVERSITY OF CALIFORNIA, IRVINE: Applications invited for two tenure-track appointments (one at senior level) in Graduate School of Management. Ph.D. required; CPA certificate desirable, must have strong capability in research. Teaching primarily at Masters and Ph.D. level. Competence in one or more associated fields, such as finance, economics, or management information systems, highly desirable. Please send resumé, names of at least three references and letter outlining teaching and research interests to: Dean Newton Margulies, Graduate School of Management, University of California, Irvine, CA 92717. Affirmative Action/Equal Opportunity Employer.

#135 FACULTY POSITION IN PUBLIC FINANCIAL MANAGEMENT. The LBJ School of Public Affairs seeks candidates for a position in Public Financial Management beginning September, 1985. Candidates should have a doctorate in a relevant social science or professional discipline or substantial public sector experience; demonstrated competence in budgetary theory and practice, program evaluation or auditing, fund accounting and financial reporting, and other areas of financial management, as well as in a related field such as public administration, microeconomics, quantitative methods, or management information systems; knowledge of one or more substantive public policy fields. Submit a current curriculum vita and names of references to Professor Susan G. Hadden, Faculty Recruitment Committee, LBJ School of Public Affairs, University of Texas at Austin, Austin, Texas 78713. The University of Texas at Austin is an equal opportunity employer.

#136 McMASTER UNIVERSITY invites applications for the following positions: (1) *Distinguished Professorial Chair in Accounting.* The holder of the Chair, which is currently occupied on a visiting basis, will be a recognized scholar who will provide academic leadership to the Accounting Area. Salary and benefits will be commensurate with the nature of this distinguished position. (2) *Tenure-track or Visiting Appointments.* Rank depends on qualifications and experience; Ph.D. (completed or near completion) is required. Research is expected and rewarded. Undergraduate and graduate teaching. Salary competitive. Apply to: Dr. James C. Gaa, Chairman, Accounting Area, Faculty of Business, McMaster University, Hamilton, Ontario, Canada L8S 4M4.

#137 THE UNIVERSITY OF NORTH CAROLINA AT GREENSBORO is seeking applications for faculty positions in Accounting (rank is dependent upon qualifications). Doctorate is desirable, however, doctoral candidates at advanced dissertation stage will be seriously considered. Research is expected. Salary negotiable. Send resumé to Dr. Charles D. Mecimore, Head, Department of Accounting, School of Business and Economics, The University of North Carolina at Greensboro, Greensboro, NC 27412. Call (919) 379-5658. An Equal Opportunity, Affirmative Action Employer.

#138 SOUTHERN METHODIST UNIVERSITY has an opening for an Assistant Professor of Accounting. Position begins Fall Semester, 1985. Earned doctorate or ABD. Research and teaching emphasized for tenure and promotion. Salary negotiable based upon experience and prior research record. Direct inquiries (including vita) to: Chairperson, Department of Accounting, Edwin L. Cox School of Business, Southern Methodist University, Dallas, Texas 75275. Southern Methodist University is an Equal Opportunity/Affirmative Action/Title IX Employer.

#139 PITTSBURG STATE UNIVERSITY is seeking faculty at the Assistant or Associate Professor rank. Ph.D. or DBA required. Rank dependent on qualifications. Candidates should have a strong interest in research and publication and effective teaching. Salaries are very competitive. Pittsburg State University is located in southeast Kansas equidistant from Kansas City, MO and Tulsa, OK, and also close to the Missouri and Arkansas Ozark Mountains and lake recreational areas. Send vita to Dr. Guy W. Owings, Chairman, Department of Accounting, Kelce School of Business and Economics, Pittsburg State University, Pittsburg, Kansas 66762. PSU is an equal opportunity, affirmative action employer.

#140 POSITION WANTED: CMA, MS (Management, Georgia Tech), partial MBIS (50%, Georgia State University), Ph.D. (Chemistry), experience in teaching Financial, Managerial and Tax Accounting (5 quarters); and Pascal language. Presently working as a Visiting Assistant Professor of Accounting in an institution offering undergraduate and graduate programs up to Ph.D. Experience in research, publication, technical management of research projects, writing research reports and proposals to funding authorities. M. Ghosal, College of Management, Georgia Tech, Atlanta, GA 30332. (404) 894-4918.

#141 OHIO UNIVERSITY has a full-time position for Assistant or Associate Professor to teach financial and/or managerial accounting at the undergraduate level. Ph.D. or D.B.A. in accounting required. Evidence of teaching and research competence is required. Professional certification and experience is desirable. Send resumé to: Professor Donald V. Stuchell, Chairman, Department of Accounting, Ohio University, Athens, Ohio 45701. Ohio University is an Equal Opportunity/Affirmative Action Employer.

#142 CLARK UNIVERSITY, Graduate School of Management, invites applications for tenure-track faculty position in Accounting, starting September 1985. Ph.D./DBA preferred; ABD or MBA/CPA considered. Rank, salary and benefits: competitive and dependent upon qualifications. Teaching load: 5 sections per year. Publication and professional activities are expected. Clark is a small, quality, private university in Worcester, New England's second largest city (42 miles west of Boston). Application deadline: February 15, 1985. Contact Dr. Richard J. Bartkowski, Assistant Professor of Accounting, Graduate School of Management, Clark University, 950 Main Street, Worcester, MA 01610. Clark University is an Equal Opportunity, Affirmative Action Employer.

#143 THE COLLEGE OF WILLIAM AND MARY invites applications for tenure-track positions as Assistant or Associate Professor of Accounting, effective September 1985. Candidates for the Assistant Professor position must have or be completing a Ph.D. or D.B.A. Candidates for the Associate Professor position must have a demonstrated record of scholarly accomplishment. The Associate Professor position is subject to budgetary approval. All faculty members are expected to be involved in both teaching and research. The College of William and Mary is a state-supported, small-scale university with average SAT scores of over 1200. The accounting program is accredited by AACSB. Send resumé to James E. Smith, Director of the Accounting Program, School of Business Administration, College of William and Mary, Williamsburg, VA 23185. AA/EOE. Minorities and women are encouraged to apply.

#144 ACCOUNTING DEPARTMENT OF OLD DOMINION UNIVERSITY seeking assistant or associate professor for tenure-track position in Managerial-Cost-Systems. Terminal degree required. ABD with substantial progress considered. ODU is a state-supported, doctoral granting institution with AACSB accreditation at graduate and undergraduate levels. Separate accounting accreditation. School of Business offers undergraduate programs in six areas and four graduate programs including MS in Accounting. Department composed of fifteen faculty members. Reasonable research environment. Applications: Dr. Richard F. Bebee, Chairman, Department of Accounting, Old Dominion University, Norfolk, Virginia 23508 by February 1, 1985. ODU is an Affirmative Action, Equal Opportunity Employer. Telephone 804/440-3529.

#145 ASSISTANT PROFESSOR OF ACCOUNTING, Department of Accounting, Murray State University. ABD or Ph.D./DBA in Accounting required; CPA, CIA, or CMA preferred. Candidate should possess a strong interest in teaching, along with the desire and capability for research. Position available August, 1985. Salary commensurate with qualifications and experience. Applications accepted until position is filled. Send resumé, transcripts, and references to: Dr. John A. Thompson, Chairman, Department of Accounting, Murray State University, Murray, KY 42071. Equal Opportunity/Affirmative Action Employer.

#146 SAN DIEGO STATE UNIVERSITY has three tenure-track openings for Assistant, Associate, and Full Professors in the areas of accounting systems, taxation, and financial accounting, to begin Fall 1985 semester. One-year temporary employment may be available as needed. The University is an Equal Opportunity/Affirmative Action Employer. Please contact G.E. Whittenburg, Chair, School of Accountancy, San Diego State University, San Diego, CA 92182. Telephone (619) 265-5310. A Doctorate is required. CPA/CMA highly desirable.

#147 TAXATION: Tax Lawyer with LL.M. (taxation) wishes to teach in graduate tax program. Numerous articles in professional journals. Currently a Visiting Professor at a state university in the southwest, but geography no barrier to relocation. Professional experience includes business, tax and estate planning for closely held businesses, tax controversies and real estate syndications. Teaching interests include partnership and corporate taxation, estate planning and tax policy, research and ethics.

#148 FACULTY POSITIONS—Cleveland State University seeks candidates for faculty positions in Accounting. Rank dependent upon qualifications. Candidates for Assistant Professor should have doctorate, or at least be in advanced dissertation stage; C.P.A., C.M.A., or C.I.A. and research capacity favorably considered. Candidates for Associate and Full Professor must have doctorate and record of publication. Salary negotiable. Send resumé to: Dr. Elise G. Jancura, Chairperson, Departments of Accounting and Business Law, Cleveland State University, 1983 E. 24th Street, Cleveland, Ohio 44115; (216) 687-4721. An equal opportunity employer m/f/h.

#149 UNIVERSITY OF IDAHO, Moscow, Idaho—Accounting Position. The Department of Accounting at the University of Idaho seeks applicants for a full-time position in accounting at the assistant or associate professor rank. Ph.D. or DBA in accounting is required. Successful teaching, research, and professional or business experience are desirable. CPA and/or CMA desirable. ABD's will be considered. Contact: Jeff L. Harkins, Department of Accounting, University of Idaho; Moscow, ID 83843, or call 208/885-7300. Closing date March 15, 1985. The UI is an EO/AA employer.

#150 ACCOUNTING: LOUISIANA STATE UNIVERSITY AT SHREVEPORT has a faculty position open until filled in Accounting at the Assistant or Associate rank. An interested candidate must have the Ph.D. or D.B.A., an interest in research, and be an effective teacher. Respond to Barry Lewis, Head, Department of Accounting, LSU-Shreveport, 8515 Youree Drive, Shreveport, LA 71115; an equal opportunity/affirmative action employer.

#151 POSITION WANTED: M.Com. (Honors), C.P.A., C.M.A. with nineteen years teaching experience and numerous publications seeks tenure-track position at an institution with a balanced teaching/research philosophy. Major teaching and research interests are in Managerial Accounting.

#152 ACCOUNTING FACULTY, FALL, 1985. Two tenure-track positions and one limited term position available to teach undergraduate and MBA accounting courses. Earned Doctorate preferred, Master's with CPA or CMA acceptable. Prior business experience essential. We seek candidates who are comfortable with and can contribute to the mission of a Catholic liberal arts college which is committed to the total development of the individual student. We emphasize high quality teaching and strong teacher/student relationship. Research or consulting is encouraged. Send resumé to: Frank Coglitore, College of St. Thomas, Department of Business Administration, 2115 Summit Avenue, St. Paul, Minnesota 55105.

#153 RENSSELAER POLYTECHNIC INSTITUTE, School of Management. Applications are invited for an accounting position at the assistant or associate professor level. An interest in technology, production, or entrepreneurship is desirable, but not essential. Both research performance and effective teaching will be essential for success in the RPI environment. Salary and working conditions are very attractive. Send resumés to Professor Dale S. Beach, Chairman, Managerial Policy and Organization Department, School of Management, Rensselaer Polytechnic Institute, Troy, New York 12180-3590. RPI is an Affirmative Action/Equal Opportunity educational institution.

#154 PURDUE UNIVERSITY KRANNERT GRADUATE SCHOOL OF MANAGEMENT is seeking applicants for the position of Professor of Accounting and Area Coordinator beginning in the Fall of 1985 or Fall of 1986. Candidates should hold a Ph.D. degree and have an established record of high quality research and teaching. Duties include advising junior colleagues on their research activities, building a strong Ph.D. program in accounting, teaching, and coordinating the teaching and research activities of the eleven-person accounting group. Qualified candidates are encouraged to apply. Contact Associate Dean Donald C. King, Krannert Graduate School of Management, Purdue University, West Lafayette, Indiana 47907. Purdue University is an Equal Opportunity/Affirmative Action Employer.

#155 THE UNIVERSITY OF NORTHERN IOWA, School of Business, Department of Accounting, is seeking candidates for a permanent position in accounting at either the Assistant or Associate level. The candidate should be prepared to teach high-quality M.B.A. students and advanced courses to an unusually motivated group of undergraduates. The School of Business, which includes 58 full-time equivalent faculty members, provides an environment of warm collegial relationships coupled with a high degree of professionalism. Performance evaluation is based on a blend of good teaching, research, and professional service. The blend is tailor-made to fit each faculty member's needs and interests. The university is located in a prosperous metropolitan area of 130,000 with abundant opportunities for executive development and consulting. Salary will be competitive. The University of Northern Iowa is an affirmative action employer. Women and minorities are encouraged to apply. Send current vita to Dr. Gaylon Halverson, Head, Department of Accounting, School of Business, University of Northern Iowa, Cedar Falls, IA 50614.

#156 INSTRUCTOR OR ASSISTANT PROFESSOR, Business Administration and Economics, Fall 1985. Non-Tenure. Teach undergraduate and MBA courses in finance and accounting. Deadline March 31, 1985. Vita, references, Dr. Mark Mathews, Business Administration Department, California Lutheran College, Thousand Oaks, CA 91360. Equal Opportunity Employer.

#157 POSITION WANTED IN TAXATION; Sunbelt location; LLM/CPA; publications; administrative experience; university, community and professional service; also government and business experience.

#158 TENNESSEE TECH UNIVERSITY anticipates an open position in rapidly expanding Department of Accounting. All levels invited to apply. Doctorate required, professional certification preferred; for Associate/Full appropriate level of scholarly achievement required. Salary competitive with AACSB "public accredited" schools, among fringe benefits is on-going in-house microcomputer training program for accounting faculty. Anticipated opening is for Fall 1985. Position open until filled. Contact: Dr. Russell C. Kick, Jr., Chairperson, Department of Accounting, P.O. Box 5024, Tennessee Tech University, Cookeville, TN 38505. TTU is an Equal Opportunity/Affirmative Action Employer. We comply with Title IX of the Educational Amendments of 1972 and the Vietnam Era Veterans Readjustment Act of 1974.

#159 GRADUATE TAX PROFESSOR—J.D., M.S., CPA. Eight years teaching experience and three years Big Eight experience. Prefer school with graduate program, but may consider teaching in undergrad institution which offers unusual opportunity. Southeast, South, West or Northwest. Available August, 1985. Write for resumé. Please furnish information on the folllowing: Teaching loads, research expectations and support, significant fringe benefits, salary ranges for associate and full professors, tenure requirements, and academic standards for students entering graduate and accounting programs.

#160 THE UNIVERSITY OF MARYLAND University College seeks excellent teachers for undergraduate courses on U.S. military bases in Europe and Asia. Minimum requirements include a master's in accounting, one year of recent college teaching experience, and U.S. citizenship. Renewable annual appointments begin August 1985. Excellent for a sabbatical or leave of absence. Benefits include transportation, a currency adjustment allowance, and military base privileges.

Frequent travel and the cost of schooling make these positions difficult for those with children. Send resumé to Dr. Lois A. Mohr, The University of Maryland University College, College Park, MD 20742. Affirmative Action/Equal Opportunity Employer.

#161 LAMAR UNIVERSITY has one tenure-track position in accounting starting July or August, 1985. Applicants should possess either Ph.D. or DBA. Research and publications required. Salary competitive. Lamar University is a state-supported university located in southeast Texas. Send resumé and list of references to: Dr. Malcolm W. Veuleman, P.O. Box 10069—Lamar University Station, Beaumont, Texas 77710.

#162 ONE POSITION, rank open, in Accounting in the Graduate School of Administration. Duties include graduate instruction, course development, a high level of research productivity. Applicants should have research experience or demonstrated potential in at least one of the following areas: managerial accounting, planning and control systems, or accounting information systems. Ph.D. or equivalent is required. Send vita and names and addresses of four references to Gary M. Walton, Dean, Graduate School of Administration, A-2, University of California, Davis 95616. Position open until filled, but to guarantee consideration, applications should be received by March 15, 1985; position available by July 1, 1985. The University of California is an equal opportunity, affirmative action employer.

#163 CHAPMAN COLLEGE School of Business, in Orange County, California, invites applications to fill one tenure-track position in accounting available Fall, 1985. The School offers a Bachelor of Science in Business Administration with a major in accounting and preparation for the C.P.A. exam. Applicants should have a Master's degree in Accounting and the C.P.A. Accounting experience and further education is preferred. Excellence in teaching and scholarship and/or professional activity is required. Salary open. Send resumé to: Lynne Pierson, Assistant Dean, School of Business, Chapman College, Orange, CA 92666. Deadline: January 30, 1985.

#164. BOWLINC GREEN STATE UNIVERSITY, Department of Accounting and Management Information Services, is seeking applicants for department CHAIR (full or associate level) as well as for tenure-track positions (associate or assistant) in accounting or management information systems, starting August 1985. Requirements in all cases are for a Ph.D. (or an advanced-stage ABD at the assistant level), with the CPA, CMA, or CIA certificate desirable. Tenure-track faculty should be committed to research and teaching at both the undergraduate and graduate levels; in addition, the Chair must have administrative facility, leadership skills, and the ability to work with the profession. The University, a state-supported institution with an enrollment of approximately 16,000, is located 25 miles south of Toledo and 120 miles west of Cleveland. The Department houses 1300 undergraduate majors and a Master of Accountancy program. The faculty totals 26 members, of whom 14 are doctorally qualified. Salaries are competitive and dependent upon credentials and experience. Applications for the position of Chair should be sent to the Office of the Dean, College of Business Administration, Bowling Green State University, Bowling Green, OH 43403 by February 15, 1985. Applications for other positions should be directed to Professor Park E. Leathers, Acting Chair, Department of Accounting and Management Information Systems, Bowling Green State University, Bowling Green, OH 43403. Bowling Green is an Equal Opportunity/Affirmative Action Employer.

#165 THE COLLEGE OF CHARLESTON is currently searching for an additional accounting faculty member to teach tax. The College of Charleston is located in the historic district of Charleston, South Carolina. It is near beautiful beaches and a thriving industrial and commercial center. It offers a congenial and stimulating teaching environment. Ph.D. or equivalent preferred. CPA also desired. Rank and salary depend upon qualifications. Send resumé and list of references to Dr. Mack Tennyson, Chair, Search Committee, Business Administration and Economics, College of Charleston, Charleston, South Carolina 29424. Affirmative Action/Equal Opportunity Employer.

#166 THE UNIVERSITY OF CENTRAL ARKANSAS is seeking applicants for a tenure-track position at the Associate or Full Professor level and anticipates an opening at the Instructor or Assistant Professor level. Rank is dependent upon qualifications. Teaching performance, scholarly productivity, and university service record are essential attributes to appointments at advanced rank. Ph.D./DBA is preferred. ABD or a Master's degree with CPA/CMA will be considered for Instructor or Assistant Professor. UCA is accredited by AACSB at the undergraduate level and is now seeking accreditation of MBA program. Application deadline is January 15, 1985, or until positions are filled. UCA is an affirmative action/equal opportunity employer. Submit resumés and names of three references to Dr. Bill Humphrey, Chairman, Department of Accounting, UCA, P.O. Box 1742, Conway, Arkansas 72032.

#167 TENURE-TRACK POSITION available September, 1985. Primary teaching areas: auditing, accounting theory, computer applications. Qualifications: Ph.D./DBA & CPA; ABD/CPA considered from an accredited university. All positions Assistant or Associate Professor. Selection process begins January 10, 1985 and continues until positions are filled. Direct resumé, transcripts, and letters of reference to: Dr. Olga E. Engelhardt, Dean, College of Business and Management, Northeastern Illinois University, 5500 N. St. Louis Avenue, Chicago, IL 60626. Affirmative Action/Equal Opportunity Employer.

#168 FERRIS STATE COLLEGE has the following tenure-track faculty openings: (1) Ph.D.—Teach seminars and courses in finance. (2) Ph.D., CPA—Teach upper-level and graduate courses and seminars in financial and managerial accounting. Professional involvement encouraged. (3) MBA/CPA—One should have considerable experience in auditing/systems and computers, to teach upper-level and graduate courses. The others, demonstrable teaching effectiveness in financial and managerial accounting. The Department of Accountancy has 18 full-time faculty, and in excess of 700 majors. FSC has almost 11,000 students and is located 60 miles north of Grand Rapids and 85 miles south of Travers City. Applications should be sent to Dr. Dieter H. Weiss, Chairman, Department of Accountancy, School of Business, Ferris State College, Big Rapids, MI 49307.

#169 PROFESSOR OR ASSOCIATE PROFESSOR OF ACCOUNTING, California State University, Fresno (midway between San Francisco and Los Angeles, in the San Joaquin Valley). Applications for 1985–86 are being accepted from candidates who can demonstrate teaching effectiveness and research capabilities in accounting. Normally, the doctorate is required for a tenure-track appointment. The Department's strongest needs are for persons with the doctorate and CPA, CMA, or CIA certification, with professional experience, and an ability to teach and an interest in teaching graduate courses. Graduate and undergraduate programs are accredited by AACSB. California State University, Fresno is an Equal Opportunity/Affirmative Action Employer. Interested candidates are invited to submit their curriculum vitae to Gerald L. Johnston, Department of Accountancy, California State University, Fresno, CA 93740-0006.

#170 FACULTY POSITION(S)—Assistant or Associate Professor of Accounting. Doctorate or ABD required. Taxation, systems, financial, or managerial specialties are requested. Expansion of staff and replacement of retired faculty are needed. The Department of Accounting, College of Business Administration, is located in a new building equipped with computer facilities for research and teaching. The University is located in an attractive residential area. Salaries and faculty benefits are excellent. Address your applications and inquiries to: R. E. Hansen, Chairman, Department of Accounting, College of Business Administration, The University of Toledo, Toledo, OH 43606. An affirmative action/equal opportunity employer.

#171 DEPARTMENT OF ACCOUNTING, CALIFORNIA STATE UNIVERSITY, LOS ANGELES, is seeking a senior rank professor as department chair. An earned doctorate in accounting or a related field is required. The applicant's experience should include demonstrated capabilities in teaching and research, demonstrated administrative capabilities, and professional certification. Salary will be commensurate with qualifications and experience. Cal State L.A. is an Equal Opportunity/Affirmative Action/Handicapped/Title IX Employer. Applications will be considered until December 3, 1984 or until position is filled. Applications and nominations should be sent to Professor Michael A. Diamond, Chair Search Committee, Department of Accounting, Cal State L.A., Los Angeles, CA 90032.

#172 THE UNIVERSITY OF DAYTON is seeking applications for the position of Chairperson, Department of Accounting. Applicants must possess a doctorate in accounting and a scholarly research record. Administrative experience in higher education and appropriate professional certification are highly desirable. In addition to teaching part-time, the Chairperson is expected to assume a leadership role in academic and research programs and to strengthen an already successful relationship with the business community. Salary and rank are competitive based upon qualifications. Please send resumés or nominations to Professor Willard Clark, Chairman, Search Committee, Department of Accounting, University of Dayton, Dayton, Ohio 45469. The University of Dayton is an equal opportunity, affirmative action employer.

#173 CALIFORNIA STATE, STANISLAUS seeks faculty in Accounting. Rank and salary open, depending on qualifications. Undergraduate and graduate programs. Teaching excellence stressed; scholarship and professional activity encouraged. Modern facilities, rural setting, low-cost housing. 4-1-4 calendar eliminates disadvantages of traditional semester and quarter systems. Two-hour drive to San Francisco or High Sierra. Require relevant doctorate earned or very close to completion. Prefer proven record of teaching excellence. CPA preferred. Strength in Auditing especially desired. Cal State Stanislaus is an Affirmative Action/Equal Opportunity/Title IX/Section 504 Employer. Applications and inquiries should be directed to: Dr. David O. Jenkins, Chair; Department of Accounting; School of Business Administration; California State, Stanislaus; Turlock, CA 95380. Telephone (209) 667-3287.

#174 ACCOUNTING: Lander College, a four-year state college located in the Piedmont area of South Carolina, has a tenure-track opening in Accounting for Fall 1985. Candidates must hold a doctorate or be in final stages of degree program. Salary will be very competitive for someone with doctorate and rank is negotiable. Primary responsibility will be teaching at the undergraduate level. Research is encouraged and supported. Send resumé to Dr. John McAlhany, Chairperson, Department of Business Administration, Lander College, Greenwood, South Carolina 29646. An equal opportunity, affirmative action employer.

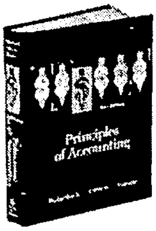
#175 BUCKNELL UNIVERSITY invites applications for two tenure-track faculty positions in its accounting program. Our immediate needs are in auditing and in cost/managerial accounting, but candidates with other interests will be considered. Ph.D. or D.B.A. strongly preferred. Candidates should be dedicated to teaching excellence and have an interest in research and professional activities. Rank commensurate with experience and academic background. Salary and fringe benefits are *very* competitive. Send resumé or inquiries to Dr. John A. Miller, Chairman, Department of Management, Bucknell University, Lewisburg, PA 17837, or call (717) 524-1306. Application deadline: January 15, 1985 or until positions are filled. An Affirmative Action/Equal Opportunity Employer.

#176 UNIVERSITY OF LOUISVILLE invites applications for the position of Assistant Professor of Accounting. Minimal qualifications are: A Ph.D. or DBA with convincing evidence of expertise in accounting, demonstrated potential for teaching effectiveness, and demonstrated potential for quality research capabilities. The department will consider an individual who is ABD for these positions. Beyond minimal qualifications, preference will be given for demonstrated research, relevant practical experience, and CPA or CMA certification. The school has AACSB accreditation at the undergraduate level. If interested, send your vita by January 31 to: Dr. Alan Attaway, Chairman, Department of Accounting/Commercial Law, School of Business, University of Louisville, Louisville, Kentucky 40292. An Affirmative Action/Equal Opportunity Employer.

#177 POSITION AVAILABLE to teach accounting courses at Manchester College. Doctorate preferred but MBA or JD will be seriously considered. CPA and/or CMA desirable. Teaching assignment will be dependent upon interest and background of individual employed. Contact: Arthur Gilbert, Director of Accounting Studies, Manchester College, North Manchester, IN 46962.

#178 UNIVERSITY OF BALTIMORE has openings for several faculty in Accounting. Positions are available both for those in the early stages of their academic careers, and for more accomplished academicians, or professionals from the fields of public accounting, private accounting, or taxation. Although the doctorate is desirable, consideration will be given to those who present alternative credentials in terms of academic, teaching, or professional experience. Salary and other compensation and perquisites are competitive and dependent on qualifications and experience. To apply, please contact: Professor John Sigler, Chairman, Department of Accounting, University of Baltimore, Charles at Mt. Royal, Baltimore, Maryland 21201. (301) 625-3214. The University of Baltimore is an Equal Opportunity, Affirmative Action Employer.

#179 THE UNIVERSITY OF WISCONSIN—GREEN BAY announces the availability of one accounting faculty position effective Fall 1985. Candidates must possess earned doctorate in accounting or be ABD in the dissertation of their doctoral work. Position entails teaching courseload of nine credits per semester in either financial or managerial accounting areas. Salaries will be highly competitive with other salaries in the United States for comparable positions. Contact Dr. Karl M. Zehms, Chairman, Program in Accounting, University of Wisconsin—Green Bay, Green Bay, WI 54301. Telephone (414) 465-2051. The University is an Equal Opportunity/Affirmative Action Employer.



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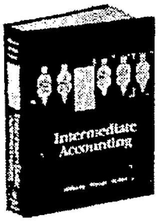

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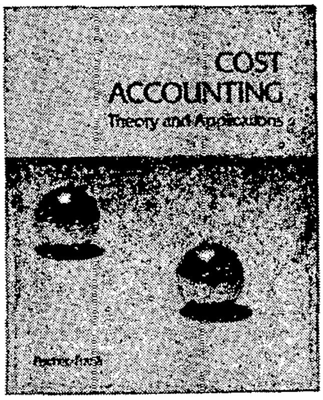

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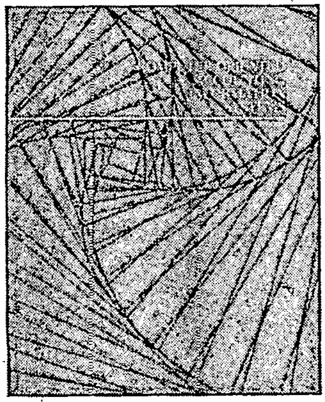

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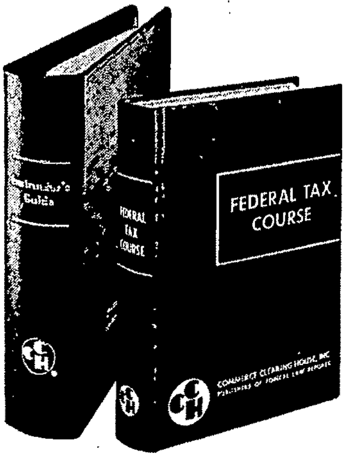

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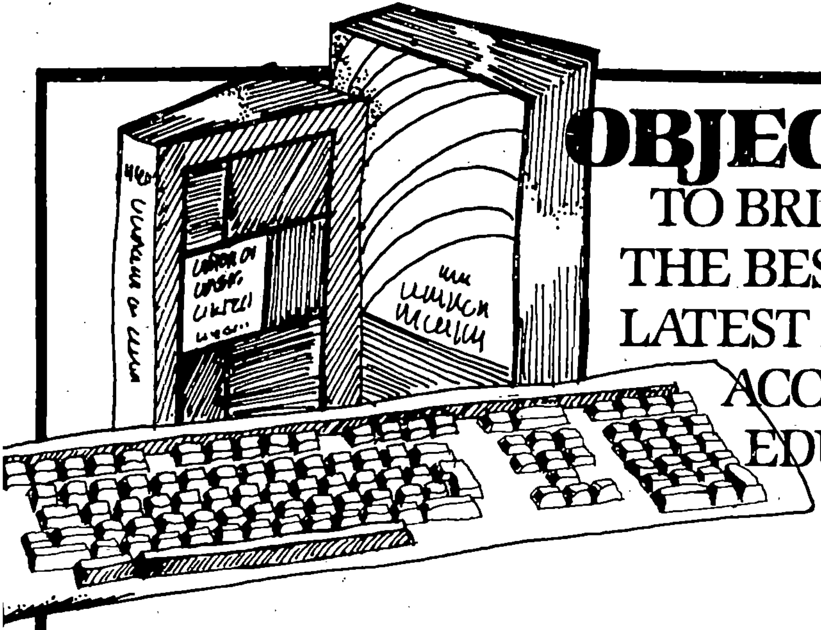

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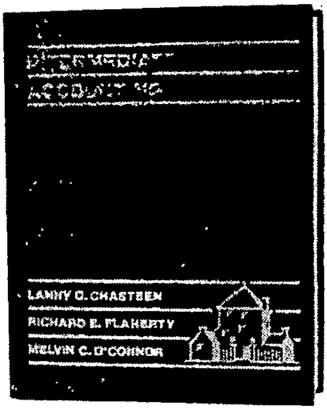

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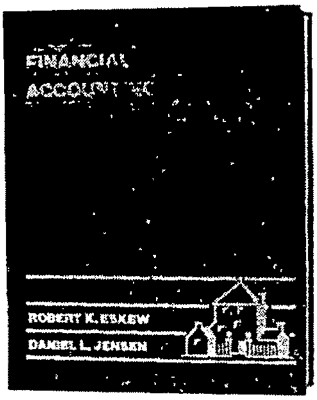

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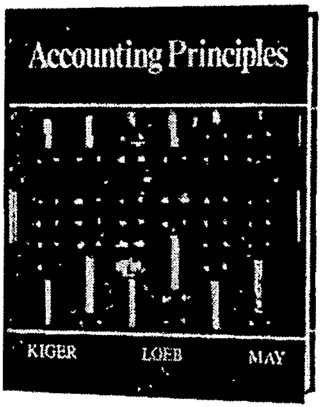

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A Horizontal Equity Analysis of the Minimum Tax Provisions: An Empirical Study

Kenneth E. Anderson

ABSTRACT: Congress introduced the first version of the minimum tax provisions in the Tax Reform Act of 1969. Congress subsequently modified the minimum tax provisions with the Tax Reform Act of 1976 (TRA76), the Revenue Act of 1978 (RA78), and the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). This study evaluates the TRA76, RA78, and TEFRA minimum tax provisions from the perspective of horizontal equity. The study is based on taxpayer data from the 1978 Individual Tax Model prepared by the Internal Revenue Service (IRS). Relevant individuals are classified into groups of equally-situated taxpayers based on expanded income. For each such group, the coefficient of variation (CV) is computed, and the three minimum tax structures are compared for their relative equity effects. The study generally concludes that the TRA76 add-on minimum tax best enhances horizontal equity.

BACKGROUND

Horizontal Equity and The Minimum Tax

A NUMBER of so-called tax preferences exist in current U.S. tax law. Congress has enacted certain incentives (preferences) at various times to provide economic and social stimuli for desired activities. However, these preferences cause differential treatment among taxpayers having the same amount of income, thereby creating horizontal inequities in the tax system [Musgrave and Musgrave, 1980, p. 393]. Horizontal equity holds that taxpayers with equal income should pay equal taxes regardless of the source or nature of that income [Musgrave and Musgrave, 1980, pp. 242–243]. To mitigate the inequities caused by tax preferences, Congress introduced the minimum tax provisions in 1969 and subsequently modified the provisions in 1976, 1978, and 1982.

The minimum tax was first enacted as part of the Tax Reform Act of 1969 (TRA69) and took the form of an "add-on" tax based on the sum of certain tax preferences defined in the Internal Revenue Code (I.R.C.). It was later modified and strengthened by the Tax Reform Act of 1976 (TRA76), which retained the add-on feature and was calculated by applying

I wish to thank Professor Jerrold J. Stern for the numerous excellent suggestions and the valuable counsel he provided during the writing of the dissertation on which this article is based, and for the helpful comments he offered during the writing of the revised paper. I wish also to thank the reviewers, whose comments and suggestions considerably enhanced the quality of the article.

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a 15 percent rate to aggregate tax preferences reduced by the greater of $10,000 or one-half the regular tax. The resultant minimum tax was added to the taxpayer's regular tax [I.R.C. Section 56].

The Revenue Act of 1978 (RA78) modified the minimum tax rules by establishing an alternative minimum tax in addition to the add-on minimum tax. Under RA78, the add-on minimum tax was calculated as before except that two preferences, the net capital gains deduction and adjusted (excessive) itemized deductions, no longer were subject to the add-on minimum tax. Instead, these two preference items were subject to a separate alternative minimum tax calculation [I.R.C. Section 55]. As a result of RA78, the minimum tax was a hybrid of an add-on minimum tax based directly on the amount of tax preferences and an alternative minimum tax based on a broadened income concept.

The Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) repealed the add-on minimum tax for individuals and subjected all preferences to a modified version of the alternative minimum tax [I.R.C. Section 55]. As under the RA78 alternative minimum tax, the taxpayer must determine an income-oriented tax base separate from the regular tax base. However, TEFRA increased the comprehensiveness of the base by including all statutory preferences and allowing only limited itemized deductions and an exemption. This expanded base is subject to a 20 percent rate, and the taxpayer pays the alternative minimum tax if the amount so computed exceeds the taxpayer's regular tax.[1]

In enacting the minimum tax provisions, Congress was seeking a way to decrease inequities caused by certain tax preferences while retaining their incentives. Congress decided to approach the problem indirectly through the minimum tax rather than directly by reducing or eliminating preferences. This action reveals the conflicting aims of equity and incentives. Generally, an increase in one results in a decrease in the other. Thus, the minimum tax signifies an uneasy compromise between competing goals.

Nevertheless, the TEFRA changes may be signaling a move toward comprehensive taxation or a flat-rate tax system.[2] Moreover, current tax reform proposals indicate a shift in emphasis toward equity and fairness. For example, the numerous flat-rate tax bills in Congress[3] and the recent Treasury Department proposal [Treasury, 1984] all seek to broaden the income tax base by eliminating or reducing preferences, thereby making the minimum tax unnecessary. Whether Congress adopts a direct approach or retains some form of the minimum tax remains to be seen.

Objective of the Study

Horizontal equity has assumed a basic and prominent role in the evaluation of tax systems and has received much attention in recent years [e.g., Musgrave and Musgrave, 1980; Plotnick, 1981 and 1982; Madeo and Madeo, 1981; Hettich, 1983]. Because the minimum tax provisions were enacted to mitigate inequities caused by tax preferences, this study employs measures of horizontal equity to quantify and assess the degree to which the TRA76, RA78, and TEFRA minimum tax provisions increase horizontal equity for individuals as compared to the regular income tax without the minimum tax.[4]

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[1] After each of these major Acts, Congress also made subsequent technical corrections and modifications. See Anderson [1983] for a detailed legislative history of the minimum tax provisions through TEFRA. Also see footnote 7 below. In addition, a number of articles discuss the technical aspects of the minimum tax rules. For example, for TRA69 see Davenport and Goldman [1970], for TRA76 see Dominianni [1978], for RA78 see Garlock [1980 and 1981], and for TEFRA see Garlock [1983] and Kulsrud [1983].

[2] See Graetz [1983] for arguments that the TEFRA alternative minimum tax may be a step toward a flat-rate tax.

[3] For comprehensive discussions of flat-rate tax proposals see U.S. Congress, Senate [1982] and U.S. Congress, House [1984].

Overview of Prior Research

Two previous studies have examined the equity effects of the minimum tax provisions. Arlinghaus [1978] examined the impact of the TRA76 minimum tax provisions on horizontal equity. He used hypothetical data and calculated mean effective tax rates with and without the TRA76 minimum tax. After classifying taxpayers into equally-situated groups based on a comprehensive measure of income, he used several indices of dispersion to measure horizontal equity. He concluded that the TRA76 minimum tax increased horizontal equity as compared to the regular tax without the minimum tax.

Madeo and Madeo [1981] examined the impact of the TRA76 and RA78 minimum tax provisions on horizontal equity. They used the 1976 Individual Tax Model as a data source and made necessary adjustments to reflect the impact of 1976 and 1978 tax law. They classified taxpayers into six adjusted gross income (AGI) groups and further divided each AGI group into five categories. Category I represented all taxpayers, and Categories II through V represented taxpayers who paid or who would have paid some minimum tax. Within each AGI group, they compared the average tax liabilities for Categories II, III, IV, and V with the average tax liability for Category I. They construed differences in average tax liabilities as indicating whether the minimum tax had been "too effective" (average liability greater than Category I) or not effective enough (average liability less than Category I) in promoting horizontal equity. However, because they grouped taxpayers by AGI, their results were mixed and difficult to interpret.

The present study extends the Arlinghaus study by using actual data, thereby providing greater external validity. It extends the Madeo and Madeo study by using "expanded income" as a classification criterion and the coefficient of variation as a horizontal equity measure. In addition, this study incorporates recently enacted tax law changes and thus provides an updated comparative equity analysis of the minimum tax provisions. These aspects of the study are discussed in the RESEARCH METHOD section below.

RESEARCH METHOD

The Data

The study employs actual tax return data from the 1978 Individual Tax Model. The Internal Revenue Service (IRS) produces the Individual Tax Model by selecting a stratified sample from all returns filed during a particular year. The 1978 model contains a sample of 157,518 records, and each record contains up to 192 data items pertaining to one tax return.

The 1978 model was selected for the study because it contains a larger, more complete set of taxpayers reporting tax preferences than do later models. Under RA78 (effective for 1979–1982), preferences were split between two separate minimum tax calculations and reported separately. As a result, taxpayers having

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[4] The present study does not examine the vertical equity implications of the minimum tax provisions. Vertical equity holds that taxpayers with different amounts of income should be subject to different tax rates and has provided the basis for progressive taxation. Vertical equity offers a topic for further research. This study also does not examine the TRA69 minimum tax provisions. The TRA69 minimum tax was generally weak and ineffective, a problem corrected by TRA76. Thus, TRA76 better represents an effective add-on type minimum tax.

FIGURE 1

TAXPAYERS USED IN STUDY

Taxpayers reporting preferences		22,897
Less:		
Taxpayers filing as heads of households	493	
Married taxpayers filing separate returns	200	
Single taxpayers	2,251	
MFJ taxpayers having tax preferences under $10,000	1,332	
MFJ taxpayer having erroneous data in model	1	4,277
Total MFJ taxpayers used in study		18,620

tax preferences were less likely to reach the threshold for reporting these preferences as compared to TRA76. Under TRA76 (effective for 1977–1978), taxpayers had to report tax preferences if the aggregate of all preferences exceeded $10,000. Consequently, data important to this study are not completely available on post-1978 models.[5]

Of the 157,218 taxpayers represented in the 1978 model, 22,897 reported tax preferences. However, only the 18,620 married taxpayers filing joint returns (MFJ taxpayers) and having total preferences exceeding $10,000 are used in the study (see Figure 1).

Taxpayers filing as heads of households, married filing separately, and single are eliminated because of the small number of individuals in these filing statuses. When classified into expanded income groups, their small numbers could produce inconclusive or misleading results. Also, they are subject to different rate schedules than MFJ taxpayers. Thus, the results would not be directly comparable to the MFJ taxpayers. Taxpayers having total tax preferences under $10,000 are removed from the sample because they were not required to report tax preferences. They either reported preferences by mistake or to prove that they were not subject to the minimum tax. Although the elimination of filing statuses other than married filing jointly somewhat restricts the generalizability of the results, this restriction poses no serious problems because the majority of U.S. taxpayers who take advantage of tax preferences file joint returns.[6]

Tax Computations

To the extent permitted by the data, each individual's taxable income and regular tax liability are recomputed to conform to 1983 tax law. The following steps describe the pertinent adjustments:

1. Increase the net capital gain deduction from 50 percent to 60 percent.
2. Reduce adjusted gross income (AGI) by the increase in the net capital gains deduction.

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[5] At the time of this writing, the 1981 Individual Tax Model is the latest model available.

[6] For example, of the number of taxpayers claiming itemized deductions in 1978, 79.9 percent were married filing jointly (or surviving spouses). Of the number of taxpayers reporting capital gains in 1978, 79.7 were married filing jointly (or surviving spouses) [IRS, 1981, p. 58].

3. Limit the charitable contribution deduction to 50 percent of reduced AGI.
4. Allow the medical deduction only to the extent it exceeds five percent of reduced AGI.
5. Allow the casualty loss deduction only to the extent it exceeds ten percent of reduced AGI.
6. Allow a $3,400 zero bracket amount.
7. Allow a $1,000 deduction for personal and dependency exemptions.
8. Determine each taxpayer's regular tax liability using 1983 tax rate schedules.
9. Limit credits based on the regular tax determined in step 8.
10. Add investment tax credit (ITC) recapture.

These adjustments result in the regular tax liability used throughout this study. Thus, the regular tax is a constant benchmark for comparing the equity effects of various minimum tax structures. This approach enhances the comparability and interpretability of the results. Accordingly, the total tax liability under each tax structure examined is as follows:

1. TRA76—Regular tax liability plus the TRA76 minimum tax.
2. RA78—Regular tax liability plus the RA78 add-on and alternative minimum taxes.
3. TEFRA—Regular tax liability plus the TEFRA alternative minimum tax.[7]

Anderson [1983] contains a detailed description of the methods and assumptions used in calculating the various minimum taxes.

Tax Preferences

Figure 2 presents a list of tax preferences as defined in I.R.C. Section 57 at various points since Congress enacted TRA76. The dates in brackets indicate the years after 1976 for which the preferences were effective. Except for Items 5b and 6b, Items 1 through 9 are used explicitly in this study because each item is either reported in the 1978 model or calculated with data reported in the model. Item 1a applies to TRA76, and Item 1b applies to RA78. In the analysis, Items 2 through 9 (except 5b and 6b) are subjected to all three minimum tax structures though Items 6a, 8, and 9 expired before TEFRA. Item 6a functions as a surrogate for 6b under TEFRA (see discussion below). Items 8 and 9 are included in the TEFRA analysis to keep the level of preferences, other than adjusted itemized deductions, constant over the three minimum tax structures. Retaining Items 8 and 9 has negligible impact on the study because only seven individuals in the sample reported Item 8 and only one individual reported Item 9.

In addition, TEFRA added Items 6b and 10 through 13, and the Economic Recovery Tax Act of 1981 (ERTA) added Item 5b. These new preferences are not contained in the 1978 model but should not materially affect the validity of the results for the following reasons:

1. The dividend exclusion is insignificant.
2. Circulation expenditures are most likely to be incurred by corporations rather than individuals.
3. Much research and mining activity also is conducted by corporations. Limited partnerships are used as

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[7] Although the alternative minimum tax is based on a separate income computation, technically the alternative minimum tax equals the excess of the separately computed tax over the regular tax (excluding ITC recapture). This excess then is added back to the regular tax (including ITC recapture). The treatment of ITC recapture conforms to a technical correction made by Act Section 711(a)(1) of the Tax Reform Act of 1984. TRA84 also made other technical modifications which do not affect this analysis.

FIGURE 2

TAX PREFERENCE ITEMS*

1. *Adjusted itemized deductions (AID).*
    a. The excess of itemized deductions (other than medical deductions and casualty losses) over 60 percent of adjusted gross income (AGI). [1977–1978]
    b. The excess of itemized deductions, other than (1) state, local, and foreign taxes, (2) medical deductions, (3) casualty losses, and (4) certain deductible estate taxes, over 60 percent of AGI reduced by the four preceding items. [1979–1982]
2. *Capital Gains.* The net capital gains deduction. [1977–]
3. *Depletion.* The excess of depletion over the adjusted basis of the property. [1977–]
4. *Intangible drilling costs.* With respect to oil and gas properties, the amount by which excess intangible drilling costs exceed net income from the properties. [1977–]
5. *Accelerated depreciation on real property and leased personal property.*
    a. Non-ACRS property: The excess of accelerated depreciation allowable over a hypothetical straight-line depreciation allowance. [1977–]
    b. ACRS property: The excess of accelerated cost recovery allowable over a hypothetical straight-line cost recovery allowance. [1981–]
6. *Stock options.*
    a. With respect to a qualified stock option, the excess of the fair market value of the stock at the time of exercise over the option price. [1977–1981]
    b. With respect to an incentive stock option, the excess of the fair market value of the stock at the time of exercise over the option price. [1983–]
7. *Amortization of certified pollution control facilities.* The excess of 60-month amortization over depreciation otherwise allowable. [1977–]
8. *Amortization of rolling stock.* The excess of 60-month amortization over depreciation otherwise allowable. [1977–1981]
9. *Amortization of child care facilities.* The excess of 60-month amortization over depreciation otherwise allowable. [1977–1982]
10. *Dividend exclusion.* The $100 ($200 MFJ) dividend exclusion. [1983–]
11. *Circulation expenditures.* The excess of the allowable current year deduction over a hypothetical three-year amortized amount. [1983–]
12. *Mining exploration and development costs.* The excess of the allowable current year deduction over a hypothetical ten-year amortized amount. [1983–]
13. *Research and experimental expenditures.* The excess of the allowable current year deduction over a hypothetical ten-year amortized amount. [1983–]

*Based on I.R.C. Section 57, which has changed over the period that the minimum tax provisions have been in effect. The dates in brackets indicate the years after 1976 for which the particular preference item was effective. The beginning date is the earlier of 1977 (the first TRA76 year) or the date the preference was first listed in I.R.C. Section 57. The ending date, if any, is the earlier of the last year the underlying preferential treatment was allowed or the last year the item was listed in I.R.C. Section 57.

well, although the extent of partnership activity is difficult to estimate.[8] However, research and mining expenditures are not considered tax preferences if the taxpayer elects to amortize them over a ten-year period [I.R.C. Section 58(i)].

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[8] R&D limited partnership activity is primarily confined to the "high tech" industry. Consequently, on a national level, the incidence of the research preference by individuals (via limited partnerships) should be significantly less than the major tax preferences, such as the capital gains deduction, accelerated depreciation, depletion, and intangible drilling costs. *The Wall Street Journal* [Sept. 26, 1983] made similar points as indicated in the following quote: "But although many more R&D shelters are available than ever before, they are still in

4. The preference for the "bargain element" of incentive stock options is identical to the prior preference for qualified stock options. Therefore, in calculating the alternative minimum tax under TEFRA, the qualified stock option preference reported in the 1978 model is used as a surrogate for the incentive stock option preference.
5. There is no *a priori* reason to believe that the distribution of the accelerated cost recovery preference over taxpayers in a given year will be significantly different than that of the accelerated depreciation preference. Therefore, accelerated depreciation reported in the 1978 model should adequately represent this type of preference.

Moreover, even if the new preference data were available, it could be argued that, in the analysis, these preferences should be subject to the TRA76 and RA78 minimum tax structures as well, thereby somewhat nullifying their impact in the study. If Congress had reverted to an add-on minimum tax, such as TRA76, instead of enacting the TEFRA alternative minimum tax, Congress probably would have added the new preferences in any case. The purpose of this study is to examine how the various minimum tax structures, e.g., add-on, hybrid, and alternative, affect equity given a set of basic taxpayer data including preferences. Except for the preference for adjusted itemized deductions, the actual composition of preferences making up total preferences under I.R.C. Section 57 is not germane to the structure of the minimum tax rules. A second argument could be made that a given taxpayer who invests in one of the new preference activities would do so in lieu of another investment, thereby leaving his or her total level of preferences about the same. Therefore, the data used in the study provide a good representation of total tax preferences incurred by individuals and should produce results sufficiently valid to assess the horizontal equity impact of the various minimum tax structures.

Classification of Taxpayers

The analysis of the minimum tax from a horizontal equity perspective requires that individuals be placed into groups of equally-situated taxpayers. Equally-situated taxpayers are those having the same or similar amounts of income, where income represents ability to pay taxes. The need for this classification system follows from the horizontal equity concept, which holds that taxpayers with equal incomes should pay equal taxes. This concept of horizontal equity also implies that a comprehensive measure of income, rather than statutory taxable income, be used as the criterion for classification [Musgrave and Musgrave, 1980, p. 243].

One comprehensive measure, the Haig-Simons definition of income [Simons, 1938; Haig, 1959], meets this criterion because it captures all accretions in wealth. However, many of the items included in Haig-Simons income, for example unrealized gains and municipal bond interest, are not available in the Individual Tax Model. The model only includes information reported by taxpayers. Consequently, a study using the model requires a comprehensive income measure that is compatible with the information reported in the model.

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short supply, especially in comparison with the number of real-estate and oil and gas shelters offered each year. Few hard figures can be found, but it's estimated that R&D shelters account for only 4% of the total $11.5 billion annual tax-shelter market."

TABLE 1

EXPANDED INCOME GROUPS AND FREQUENCY ANALYSIS

			Percentage Paying Some Minimum Tax		
(1) EI Group	*(2) Range of Expanded Income*	*(3) No. in Group*	*(4) TRA76*	*(5) RA78*	*(6) TEFRA*
1	Less than- 3,400	1,062	2.0	1.3	0.0
2	3,400- 5,500	15	0.0	0.0	0.0
3	5,500- 7,600	12	8.3	8.3	0.0
4	7,600- 11,900	35	8.6	2.9	0.0
5	11,900- 16,000	48	8.3	0.0	0.0
6	16,000- 20,200	51	45.1	5.9	0.0
7	20,200- 24,600	67	74.6	9.0	0.0
8	24,600- 29,900	105	86.7	14.3	0.0
9	29,900- 35,200	105	96.2	21.9	0.0
10	35,200- 45,800	295	99.7	27.4	6.4
11	45,800- 60,000	482	100.0	28.2	20.7
12	60,000- 85,600	1,091	99.8	28.8	24.9
13	85,600- 109,400	830	98.0	37.8	30.2
14	109,400- 200,000	3,186	83.1	31.9	22.1
15	200,000- 300,000	2,813	62.6	27.4	19.9
16	300,000- 400,000	1,658	65.7	28.7	21.4
17	400,000- 500,000	977	71.0	37.5	30.1
18	500,000- 600,000	1,017	51.0	26.9	22.6
19	600,000- 700,000	829	56.5	29.6	20.4
20	700,000- 800,000	659	60.9	27.3	20.5
21	800,000- 900,000	499	67.5	33.5	26.7
22	900,000- 1,000,000	447	74.9	35.8	33.3
23	1,000,000- 2,000,000	1,668	80.3	44.8	42.2
24	2,000,000- 3,000,000	370	77.3	48.4	46.2
25	3,000,000- 4,000,000	125	88.8	56.0	58.4
26	4,000,000- 5,000,000	68	79.4	47.1	47.1
27	5,000,000-10,000,000	80	78.8	51.3	42.5
28	More than 10,000,000	26	88.5	73.1	61.5
Total / / Overall Percentage		18,620	70.3	30.3	23.6

One such measure is "expanded income," defined as adjusted gross income (AGI) plus tax preference items excluded from AGI minus investment interest to the extent such interest does not exceed investment income [IRS, 1981, pp. 4–5; Okner, 1979]. This study relies on the assumption that expanded income most accurately reflects a taxpayer's ability to pay taxes, given the limitations of the data. Accordingly, the study classifies MFJ taxpayers into expanded income (EI) groups, where each group represents equally-situated taxpayers. Columns 1 through 3 of Table 1 contain a schedule of these groups. The divisions of EI Groups 1 through 13 correspond to tax brackets in the 1983 rate schedule for MFJ taxpayers. The divisions of EI Groups 14 through 28 provide as narrow a range as possible while retaining a manageable number of groups.

Measurement of Horizontal Equity

To measure horizontal equity, the study uses the coefficient of variation, defined as follows:

$$CV_j = \frac{SD_j}{\overline{T}_j} \times 100, \qquad (1)$$

where CV_j is the coefficient of variation for EI Group j, SD_j is the standard deviation of the total tax liability for EI Group j, and $\overline{T}_j$ is the mean total tax liability for EI Group j. The term "total tax liability" refers to either the regular tax, TRA76, RA78, or TEFRA as defined in the *Tax Computations* section above.

The concept of horizontal equity implies that inequity occurs when the taxes of equally-situated taxpayers vary. Consequently, a dispersion measure which captures this variation emerges as the most appropriate type of measure for this study. The smaller the dispersion, the greater the horizontal equity.

Of the available dispersion measures, the coefficient of variation has gained wide acceptance because it is scale-free, thereby allowing comparisons of observations having different levels of income or taxes [White and White, 1965; Brennan, 1971; Ehrenberg, 1975]. Thus, the coefficient of variation facilitates intergroup comparisons. Moreover, in this study, the mean tax liabilities of various tax structures differ within EI groups. Therefore, the coefficient of variation also facilitates within-group comparisons.

RESULTS

Horizontal Equity Analysis

Table 2 sets forth the primary findings of this study. Columns 2 through 4 present the percentage decreases (increases) in the coefficient of variation (CV) that result when the minimum tax structures under TRA76, RA78, and TEFRA are compared to the regular tax without the minimum tax. For each minimum tax structure examined, the percentage decrease (increase) in the CV is calculated as follows:

Percentage decrease (increase) in CV

$$= \frac{CV_{regtax} - CV_{mintax}}{CV_{regtax}} \times 100. \qquad (2)$$

where CV_{regtax} is the CV of the regular tax liability and CV_{mintax} is the CV of either TRA76, RA78, or TEFRA as defined in the *Tax Computations* section above. A percentage decrease in the CV represents an increase in horizontal equity, while a percentage increase in the CV represents a decrease in horizontal equity.

Columns 5 through 7 of Table 2 indicate the ranking of the three minimum tax structures in terms of horizontal equity, with a rank of 1 assigned to the minimum tax having the highest percentage decrease in the CV for a particular EI group. Except for EI Groups 1 and 3, TRA76 ranks as most equitable. Except for EI Group 1, RA78 ranks as second most equitable through Group 10. However, for Groups 11 through 28, TEFRA ranks as second most equitable with RA78 ranking as least equitable. Thus, the CV implies that, of the three minimum tax structures, the TRA76 add-on minimum tax most consistently enhances horizontal equity.

The three minimum tax structures also can be ranked on an overall basis with the following weighted average formula:

$$WA = \frac{\sum_{j=1}^{28} (N_j \times PC_j)}{\sum_{j=1}^{28} N_j}, \qquad (3)$$

where N_j is the number of taxpayers in EI Group j and PC_j is the percentage change in the CV for EI Group j. This formula yields

TABLE 2
PERCENTAGE DECREASE (INCREASE) IN CV OF TAX LIABILITIES

	Percentage Decrease (Increase)			*Ranking of Percentage Decrease*			*Difference in Percentage Decrease*		
(1) EI Group	*(2) TRA76*	*(3) RA78*	*(4) TEFRA*	*(5) TRA76*	*(6) RA78*	*(7) TEFRA*	*(8) TRA76 -RA78*	*(9) TRA76 -TEFRA*	*(10) TEFRA -RA78*
1	(43.56)	(75.63)	0.00	2	3	1	32.07	(43.56)	75.63
2	0.00	0.00	0.00	—	—	—	0.00	0.00	0.00
3	(24.79)	(22.23)	0.00	3	2	1	(2.56)	(24.79)	22.23
4	18.65	10.25	0.00	1	2	3	8.40	18.65	(10.25)
5	2.81	0.00	0.00	1	2	2	2.81	2.81	0.00
6	46.40	9.04	0.00	1	2	3	37.36	46.40	(9.04)
7	49.28	25.23	0.00	1	2	3	24.05	49.28	(25.23)
8	50.71	12.79	0.00	1	2	3	37.92	50.71	(12.79)
9	52.15	16.12	0.00	1	2	3	36.03	52.15	(16.12)
10	37.92	6.21	4.43	1	2	3	31.71	33.49	(1.78)
11	45.97	18.11	18.38	1	3	2	27.86	27.59	0.27
12	31.96	10.28	21.70	1	3	2	21.68	10.26	11.42
13	33.11	15.32	26.31	1	3	2	17.79	6.80	10.99
14	26.71	14.58	22.46	1	3	2	12.13	4.25	7.88
15	28.66	19.31	24.19	1	3	2	9.35	4.47	4.88
16	32.58	22.16	26.63	1	3	2	10.42	5.95	4.47
17	35.58	26.10	32.14	1	3	2	9.48	3.44	6.04
18	31.78	22.31	25.69	1	3	2	9.47	6.09	3.38
19	31.08	22.28	26.47	1	3	2	8.80	4.61	4.19
20	30.78	22.27	26.60	1	3	2	8.51	4.18	4.33
21	35.40	25.46	32.00	1	3	2	9.94	3.40	6.54
22	38.79	26.68	33.53	1	3	2	12.11	5.26	6.85
23	37.04	27.30	32.72	1	3	2	9.74	4.32	5.42
24	40.38	28.84	35.68	1	3	2	11.54	4.70	6.84
25	45.46	34.42	39.86	1	3	2	11.04	5.60	5.44
26	44.21	32.02	38.80	1	3	2	12.19	5.41	6.78
27	32.72	17.36	24.18	1	3	2	15.36	8.54	6.82
28	21.87	17.02	20.98	1	3	2	4.85	.89	3.96
Weighted Average	28.08	14.36	23.91	1	3	2	13.72	4.17	9.55

the following weighted average percentage changes in the CV of tax liabilities:

TRA76	28.08 percent
TEFRA	23.91 percent
RA78	14.36 percent

Thus, the weighted average change in the CV shows that the TRA76 add-on minimum tax produces the greatest overall improvement in horizontal equity.

Columns 8 through 10 of Table 2 indicate that the differences among the minimum taxes diminish and stabilize in the upper EI groups. Therefore, the minimum taxes have a more diverse equity impact in lower EI groups than in upper EI groups. The divergence results from the different computational structures of the minimum taxes, particularly the amount of exemption (e.g., $10,000 for

TRA76 and $40,000 for TEFRA), and from the treatment of investment interest (see discussion in the *Behavior of CV in Low EI Groups* section below).

Frequency Analysis

Table 1, which contains a frequency analysis, provides additional insights into the effects of the minimum tax provisions. The entries in Columns 4 through 6 show the percentage of taxpayers in each EI group paying some amount of minimum tax. Table 1 indicates that TEFRA generally affects fewer taxpayers than RA78 and far fewer taxpayers than TRA76. Consequently, TRA76 spreads the burden of the minimum tax over most taxpayers with preferences rather than concentrating the burden among relatively few taxpayers as do TEFRA and RA78.

In addition to a general desire to increase equity, Congress also has indicated specific concern about high-income individuals who pay no tax because of preferences. Consequently, Congress has viewed the minimum tax as a means of subjecting these individuals to some amount of tax. Table 3 compares the efficacy of the three minimum tax structures in achieving this objective. The table shows the percentage of individuals having no regular tax liability but paying some amount of minimum tax. Generally, TRA76 subjects more of these individuals to the minimum tax than RA78 or TEFRA, although the differences diminish or disappear in the middle to upper EI groups. Nevertheless, in EI groups 11 through 27, only TRA76 taxes 100 percent of individuals who would otherwise pay no tax.

Behavior of CV in Low EI Groups

Table 2 reveals that under TRA76 and RA78 the CV behaves erratically for low EI groups, particularly Groups 1 through 5. In these groups, the percentage change in the CV exhibits wide swings between positive and negative values. This behavior results from the interaction of the adjusted itemized deductions (AID) preference and the grouping criterion. Taxpayers are grouped by expanded income, which by definition is reduced by investment interest (limited by investment income). However, investment interest is also a component of the AID preference, implying that investment interest is a preferential deduction. Therefore, the rationale behind the AID preference is inconsistent with the theory underlying the grouping criterion. Consequently, if the deduction of investment interest for expanded income is theoretically correct, the treatment of this item as a tax preference is incorrect. Table 4 compares TRA76 as enacted with TRA76 without investment interest in the AID preference. The table demonstrates that the effect of the AID preference and the associated erratic behavior of the CV disappear from EI Groups 1 through 5 when investment interest is removed from the AID calculation. In fact, without investment interest in the AID preference, TRA76 has virtually no impact in these groups. Similar results occur if investment interest is removed from the AID calculation under RA78.

Because this study relies on expanded income as the theoretically correct grouping criterion (given the limitations of the data), the results depicted in Table 4 lead this researcher to conclude that investment interest should not be considered a tax preference to the extent such interest does not exceed investment income.[9] Apparently, Congress arrived at a similar conclusion because TEFRA allows the

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[9] See Goode [1976, pp. 148–152] for a discussion of the theoretical justification for the limited deductibility of investment interest.

TABLE 3

EFFECT OF MINIMUM TAX ON INDIVIDUALS PAYING NO REGULAR TAX

		Percentage Paying Some Minimum Tax		
(1) EI Group	*(2) No. Paying No Regular Tax*	*(3) TRA76*	*(4) RA78*	*(5) TEFRA*
1	900	1.8	1.3	0.0
2	12	0.0	0.0	0.0
3	8	12.5	12.5	0.0
4	24	8.3	4.2	0.0
5	35	5.7	0.0	0.0
6	44	40.9	6.8	0.0
7	52	73.1	11.5	0.0
8	56	76.8	16.1	0.0
9	39	92.3	43.6	0.0
10	87	98.9	47.1	17.2
11	103	100.0	58.3	50.5
12	156	100.0	71.2	71.2
13	85	100.0	75.3	81.2
14	194	100.0	88.1	84.0
15	116	100.0	91.4	94.0
16	71	100.0	98.6	94.4
17	56	100.0	98.2	96.4
18	49	100.0	95.9	93.9
19	35	100.0	94.3	94.3
20	30	100.0	96.7	96.7
21	24	100.0	100.0	91.7
22	19	100.0	100.0	100.0
23	77	100.0	97.4	97.4
24	23	100.0	100.0	100.0
25	10	100.0	100.0	90.0
26	4	100.0	100.0	100.0
27	2	100.0	100.0	100.0
28	0	0.0	0.0	0.0
Total / / Overall percentage	2,311	56.1	43.0	39.0

deduction of qualified investment interest in the calculation of the TEFRA alternative minimum tax base [I.R.C. Section 55(e)].

Revenue Effects

Although Congress did not enact the minimum tax provisions primarily to raise revenues, the various minimum tax structures nevertheless have some revenue impact. The total tax liabilities and incremental minimum taxes for the sample taxpayers examined in this study are as follows:

TABLE 4

PERCENTAGE DECREASE (INCREASE) IN CV OF TAX LIABILITIES TRA76—
IMPACT OF INVESTMENT INTEREST IN AID PREFERENCE

EI Group	*With Investment Interest in AID*	*Without Investment Interest in AID*
1	(43.56)	0.00
2	0.00	0.00
3	(24.79)	0.00
4	18.65	0.00
5	2.81	.11
6	46.40	36.96
7	49.28	56.16
8	50.71	50.95
9	52.15	50.40
10	37.92	50.11
11	45.97	43.31
12	31.96	33.15
13	33.11	32.71
14	26.71	26.65
15	28.66	27.69
16	32.58	31.23
17	35.58	34.68
18	31.78	30.16
19	31.08	30.28
20	30.78	29.48
21	35.40	34.26
22	38.79	38.59
23	37.04	36.60
24	40.38	39.93
25	45.46	45.39
26	44.21	43.47
27	32.72	32.52
28	21.87	21.87
Weighted Average	28.08	30.12

	Total Tax Liability	*Incremental Minimum Tax*
Regular tax	$2.024 billion	—
TRA76	2.447 billion	$423 million
RA78	2.230 billion	206 million
TEFRA	2.276 billion	252 million

Thus, TRA76 provides approximately 1.7 times the incremental revenue of TEFRA and approximately 2.1 times that of RA78.

CONCLUSIONS

Compared with TRA76, the RA78 minimum tax proves to be an inadequate device for enhancing horizontal equity. For upper EI groups, RA78 also proves less adequate than TEFRA. In addition, RA78 ranks least effective on a weighted average basis. Finally, being a hybrid of an add-on and alternative minimum tax, RA78 provides an unnecessarily complex solution to the problem of horizontal inequities resulting from tax preferences.

If the minimum tax is the vehicle by which Congress desires to enhance equity, the add-on minimum tax, as represented by TRA76, provides the best means of accomplishing this goal. The TRA76 minimum tax offers several advantages. First, of the three minimum tax structures examined in this study, TRA76 produces the greatest increase in horizontal equity, especially if investment interest is eliminated from the AID preference. Second, TRA76 affects a large percentage of taxpayers having tax preferences, thereby spreading the burden of the minimum tax over many taxpayers. Third, TRA76, by a slight margin, best achieves the objective of taxing high-income individuals who would otherwise escape taxation because of preferences. Fourth, TRA76 raises more revenue than RA78 or TEFRA. Finally, TRA76 is simple to apply. Taxpayers merely sum their preferences, subtract an exemption or deduction, and multiply the result by a percentage. In contrast, TEFRA requires a complicated computation of an alternative tax base, and RA78 requires two separate calculations. Thus, of the three minimum tax structures, TRA76 enhances equity in the simplest fashion, thereby approaching two goals of good taxation—equity and simplicity.

If the minimum tax is the vehicle by which Congress desires both to enhance equity *and* expand the tax base, the alternative minimum tax, as represented by TEFRA, provides the best means of accomplishing these dual goals. Although TEFRA, as currently enacted, does not increase horizontal equity as much as TRA76, it nevertheless produces a distinct improvement over the regular tax. However, modifications to TEFRA that expand the alternative minimum tax base, such as reductions in exemptions or deductions, could result in substantial increases in horizontal equity.

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The Formation of Earnings Expectations

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ABSTRACT: This paper analyzes the manner in which financial analysts' forecasts of annual earnings are formed. A sample of over 6,000 earnings forecasts made over a period of 11 years is examined. The results from the time-series tests show that analysts' forecasts of annual earnings are rational in the sense that they fully utilize the information contained in the past history of earnings and their own forecasts. The findings also suggest that the adaptive expectations model adequately describes the process of the formation of earnings forecasts. The adaptation coefficient, however, is not constant across companies and over time. The results imply that the use of mean forecasts and cross-sectional (rather than time-series) tests in previous studies has reduced the tests' power and efficiency, but still led to valid conclusions.

EARNINGS represent an important variable in stock valuation and selection. Earnings are assumed to move with cash flows and their forecast is considered, therefore, important for predicting future returns. Since market earnings expectations are not directly observable, researchers generally have used surrogates in the form of predictions derived from univariate time-series models. These models seem to fit the earnings series quite well and produce satisfactory predictions. More recently, however, researchers have begun to focus on analysts' earnings forecasts as a proxy for the unobservable market expectations. Works by Givoly and Lakonishok [1979] and Elton, Gruber and Gultekin [1981] show that stock price movements are correlated with revisions in analysts' forecasts of earnings. Fried and Givoly [1982] compare the association between stock price movements and the prediction errors of analysts' forecasts and time-series models. They conclude that investors behave in a way which is more consistent with analysts' forecasts being the surrogate for market expectations of earnings. Results consistent with those findings are reported also by Gonedes, Dopuch and Penman [1976].

If indeed analysts' forecasts of earnings serve as a good proxy for the unobservable market expectation of earnings, investigation of their properties may reveal the process through which earnings expectations are formed by investors. Examination of this process is important to understanding how accounting information relates to stock price changes.

Forecasts made by market agents have long been the subject of research in economics. In particular, the formation of

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inflationary expectations has been studied extensively through the use of Livingston survey data (see, for example, the works of Gibson [1972], Pyle [1972], Lahiri [1976], Cargill [1976] and Lakonishok [1980]).

In light of the large body of literature dealing with the time-series properties of earnings and with the derivation of extrapolative prediction models, it is surprising that only scant published evidence exists on the formation of earnings forecasts. Some findings are reported by Abdel-khalik and Espejo [1978] and Brown and Rozeff [1979]. Abdel-khalik and Espejo examine the manner by which forecasts of annual earnings are revised in the wake of the release of quarterly reports. Brown and Rozeff test the behavior of revisions in financial analyst forecasts (hereafter FAF) of quarterly earnings. Both studies used Value Line forecasts and a cross-sectional regression to test the hypothesis of an adaptive formation of earnings forecasts. The results showed that revisions of FAF of annual and quarterly earnings made in the wake of quarterly reports' release can be described adequately by an adaptive process in which forecasts are updated based on the prediction error associated with the most recent quarterly earnings number. Another question that has not been explored fully is the degree to which analysts form earnings projections in a rational manner that considers all available information. Some results, based on a cross-sectional analysis, are presented by Crichfield, Dyckman and Lakonishok [1978], who find that FAF do not contain a systematic bias that can be corrected by using information on past earnings and predictions.

The purpose of this study is to analyze the process by which analysts form their annual earnings expectations. In particular, the paper addresses the question of the economic rationality of FAF and their time-series behavior. In examining the time-series behavior of FAF, previous studies focused on the effect of quarterly prediction errors. Given the accounting measurement problems of quarterly earnings and the random factors that particularly affect reported results for periods as short as one quarter, it is plausible that the prediction error of the annual earnings forecast conveys at least as much information to users of financial statements as the prediction errors from quarterly forecasts. This study relates the formation of *annual* earnings forecasts to past errors in predicting annual earnings by examining a sample of over 6,000 earnings forecasts made by about 70 forecasters over the 11 years, 1969 to 1979.

These unique and comprehensive data allow for two important additional dimensions in the examination of the formation of FAF. First, they enable the use of a time-series analysis of individual companies as opposed to the cross-sectional analysis used by previous research. (As is explained later, a time-series analysis provides a more powerful test of the hypotheses concerning the formation of FAF.) Second, unlike the studies by Abdel-khalik and Espejo [1978] and Brown and Rozeff [1979], the data relate to predictions made by about 70 forecasters, rather than by a single forecaster (Value Line), enhancing the generalizability of the results. Finally, the use of disaggregated expectational data also allows an analysis of differences between analysts, between analysts predicting the same company, and between companies. The additional tests, made possible by the more extensive data, provide evidence on whether the use in previous research of a single source of forecasts and data pooled across companies might have affected prior inferences.

The methods used here are similar to

those employed by the research on the formation of expectations of other economic variables, such as inflation, and are detailed in the following sections. The main findings are as follows:

1. Earnings expectations of financial analysts appear to be formed in a rational manner. In particular, their forecasts generally are unbiased, and their prediction errors exhibit no significant serial correlation. Furthermore, FAF seem to capture both the time-series properties and the cross-sectional dependence of the earnings series. The finding of rationality holds for disaggregated data consisting of individual forecasts, as well as for consensus forecasts.
2. The adaptive expectations model describes well the formation of annual earnings expectations. The coefficient of adaptation, however, varies across companies and years, but it appears to be uniform for different forecasters of the same company. Thus, the use by previous studies of either a single forecaster (e.g., Abdel-khalik and Espejo [1978], Brown and Rozeff [1979]), or a mean computed across forecasters (e.g., Crichfield, Dyckman and Lakonishok [1978]) has not limited the power of their tests in detecting the basic process of FAF formation.
3. The behavior of the adaptation coefficient suggests that the earnings series of some companies are not perceived by analysts as a random walk. This is consistent with recent evidence by Brooks and Buckmaster [1976], Hopwood, McKeown and Newbold [1982] and Lieber, Melnik and Ronen [1983].
4. The employment by previous research of cross-sectional tests for detecting time-series patterns (see, for example, Brown and Rozeff [1979] and Crichfield, Dyckman and Lakonishok [1978]) reduced the efficiency of these tests.

The paper is organized as follows: The first section describes the data, and the next section discusses the notion of rational expectations and presents the evidence on the rationality of FAF. The following section discusses the adaptive model, while the last section contains a summary and concluding remarks.

EARNINGS EXPECTATIONS DATA

Financial analysts' forecasts of earnings of a sample of companies listed in the S&P's *Earnings Forecaster* were evaluated in each of the 11 years, 1969 to 1979. Included in the sample for each year were the FAF (of that year's earnings) that were available at the beginning of April. These forecasts typically were first issued to the public in early March. This time of issue, in our sample companies, is invariably between the release of the annual report for the previous year (which is made, on average, in February) and the release of the first quarterly report (typically, mid-April).

Companies which satisfied the following criteria are included in the sample each year:

1. existence of at least four forecasts (by different forecasters) of the current year's earnings;
2. availability of annual earnings numbers for the forecast year and the preceding nine years;
3. fiscal year ending December 31; and
4. N.Y.S.E. listing.

The first criterion was introduced to allow the derivation of a reliable measure for the average or "consensus" forecast.

All the contemporaneous company forecasts were for primary EPS before extraordinary items.[1] The second criterion was needed to allow a time-series analysis of the forecast errors and the construction of naive extrapolative models. The third criterion ensures convenient intratemporal, cross-sectional comparisons. The fourth criterion was imposed to ensure availability of monthly return data for another study that uses the same sample of forecasts. This criterion led, however, to excluding few companies since virtually all companies that satisfied the first three criteria were N.Y.S.E. companies.

The final sample consists of 1,247 cases (company-years) with a total of 6,020 forecasts. The number of companies in each year varies from 95 (1972) to 173 (1969). This sample represents 424 distinct companies and forecasts made by 68 different forecasters.

Despite the large sample in terms of number of companies, forecasts, and forecasters, the availability of time-series of individual, or even mean, forecasts is restricted greatly by the fact that forecasts for a given company may not exist in all, or even most, years. In addition, individual forecasters may not appear in all available years of a company. To illustrate, only 58 companies have forecasts in at least seven of the 11 years and only nine forecasters provide at least seven annual forecasts (out of 11 possible) for at least one company.

RATIONAL EXPECTATIONS

Muth's [1961] criterion for rationality states that expectations should be generated by the same stochastic process that generates the variables to be forecasted. Most tests of the Muthian hypothesis, however, have employed the weaker condition that expectations fully reflect all information contained in the past history of the variable being forecasted. This means that a necessary condition for a forecast to be rational is that it is unbiased and efficient; furthermore, the forecast cannot be improved by incorporating past forecasts and realizations. The tests of rationality employed here concentrate on these properties.

The rational expectations hypothesis implies that forecasts are unbiased, or that

$$A_t = \bar{P}_t + \epsilon_t, \qquad (1)$$

where A is actual earnings, P the forecasted earnings, and ϵ a random error with a zero expectation. This relationship may be tested by averaging the prediction errors across time and companies. The relative prediction error is defined as

$$RPE \equiv (\bar{P}_t - A_t)/A_t, \qquad (2)$$

where $\bar{P}_t$ is the mean forecast for year t. The few cases in which A_t is negative are excluded from the analysis.[2] If there is a bias, RPE will be significantly different from zero. The mean RPE and its standard deviation over the years are computed for each company (the ℓn form is employed in the computation; that is, the error is computed as $\ell n(\bar{P}/A)$).[3] The results are presented in Table 1. As is apparent from the table, the bias for individual companies is very small and insignificant. In fact, only seven companies (of the 75 examined) show a significant bias at the five percent level (with four

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[1] To ensure that the comparison between the forecast and the actual EPS was not affected by changes in capitalization, any earnings forecast announced prior to the disclosure of the change in capitalization was adjusted.

[2] There are only six cases (out of 1,247 company-years in the sample) in which negative annual earnings (losses) are reported. The low incidence of losses apparently is due to the fact that the sample consists of large firms (NYSE firms followed by at least four analysts).

[3] The use of the logarithm transformation has the advantage of providing symmetric distribution of the error and reducing the impact of possible outliers on the measures.

TABLE 1

BIAS RESULTS

DISTRIBUTION OF COMPANY MEAN-RELATIVE-ERROR AND THE CORRESPONDING t-VALUES

	Company Mean Relative Error	*Company t-value of the MRE*
Mean ($n=75$)	0.012	−0.021
First Quartile	−0.030	−0.870
Median	−0.000	−0.040
Third Quartile	0.030	0.550

exhibiting a significant upward bias, and three a significant downward bias).

Forecasts may be unbiased in that their mean is not significantly different from realization, but at the same time exhibiting a bias conditioned upon that realization. For example, forecasts may contain a systematic error in that they understate earnings when earnings are low (below average) and overstate earnings when they are high (above average), keeping the forecasts "unbiased" on average. This distinction between a "level" bias (measured by $\bar{P}_t - A_t$) and what is referred to as a "regression" bias (both of which are systematic errors not contained in rational forecasts) is suggested and discussed by Theil [1966] and Mincer and Zarnowitz [1969]. To test whether these systematic errors exist, the regression

$$A_t = \alpha + \beta \bar{P}_t + \epsilon_t \qquad (3)$$

is run, and the joint hypothesis that $\alpha=0$ and $\beta=1$ is tested. The test is conducted first for the mean earnings forecast of individual companies over the 11 years.[4] The test is performed for the 40 companies for which earnings forecasts exist for at least eight years. The regression in (3) is estimated for each company j, where $\bar{P}_{jt}$ is represented by a simple average of the analysts' annual earnings forecasts for company j, available for year t. The summary statistics are reported in Table 2. The means of α and β (-0.023 and 1.009) are very close to their hypothesized values. The joint null hypothesis of $\alpha=0$, $\beta=1$ (no systematic error) could be rejected (F-test,[5] five percent significance level) only for one company (out of 40); moreover, the separate hypotheses H_0: $\alpha=0$ and H_0: $\beta=1$ could be rejected (at the five percent significance level, using the t-test) in only one and three cases, respectively. Examination of the residuals from the time-series regressions could not detect a systematic pattern. (See the distribution of the Durbin-Watson statistics in Table 2).[6]

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[4] This test, as well as other tests described in this section, were conducted also for the rate of growth in earnings as the predicted variable. Specifically, in that version A (and P) was defined as the natural logarithm of the realized (predicted) growth rate.

[5] The F-test used to test the joint hypothesis on both the intercept and the slope coefficient is

$$F_{r,n-k-1} = \frac{(RRSS - URSS)/r}{URSS/(n-k-1)}$$

where $RRSS$ is the restricted residual sum of squares (i.e., the residual sum of squares of the regression in which the coefficients are restricted to their hypothesized values), $URSS$ the unrestricted residual sum of squares, r the number of restrictions, k the number of independent variables and n the number of observations; for a discussion of the test see Maddala [1977].

[6] Details of the statistics are provided in Johnston [1972, pp. 249-254]. Note that the smallest number of observations for which significance bands are tabulated is 15. Since our tests apply to series of 11 years, bands provided in the table relate to 15 observations and thus are indicative only.

TABLE 2

TEST OF SYSTEMATIC ERRORS: SUMMARY STATISTICS FOR COMPANY TIME-SERIES REGRESSIONS (BASED ON MEAN FORECASTS)

$[A_{jt} = \alpha_j + \beta_j \bar{P}_{jt} + \epsilon_{jt}]$

	α	β	R^2	DW*	$F(H\colon \alpha=0,\ \beta=1)$**
Mean ($n=40$)	−0.023	1.009	0.692	1.84	0.998
First Quartile	−0.485	0.885	0.528	1.45	0.185
Median	−0.125	1.035	0.756	1.76	0.550
Third Quartile	0.585	1.175	0.887	2.07	1.405

* Durbin-Watson statistic. The applicable lower and upper limits (five percent significance level) d_L and d_U are 1.08 and 1.36, respectively. If $DW<2$ and $DW<d_L$($DW>2$ and $4-DW<d_L$) the hypothesis of no autocorrelation is rejected in favor of positive (negative) autocorrelation. If $D_L<DW<d_U$, the test is inconclusive. For more details, see footnote 6.

** The critical F-values in most regressions ($\nu_1=2$, $\nu_2=8$) are 4.74 (five percent significance level) and 9.55 (one percent significance level). For a description of the test, see footnote 5.

Similar findings were obtained by Crichfield, Dyckman and Lakonishok [1978] through a cross-sectional analysis. The results of this paper are stronger in that the properties of unbiasedness are found to hold not only for the forecast of the average earnings across companies but for the earnings forecasts of virtually each and every company. In general, a time-series analysis is more appropriate than a cross-sectional analysis in investigating the existence of time-series properties such as systematic prediction errors.

An alternative technique is to use a pooled regression approach whereby observations (consensus forecasts and realizations) are pooled across companies and over years. The estimated pooled regression, using the 40 companies and all years available (378 cases, with standard errors in parentheses) is:

$$\begin{aligned} A &= \underset{(0.126)}{0.016} + \underset{(0.023)}{1.009}\bar{P}; \\ F\text{-value} &= 0.153; \\ r^2 &= 0.84 \end{aligned} \tag{4}$$

These findings also are consistent with the null hypothesis of rational expectations. The residuals from the pooled regression show some tendency to increase (in absolute value) with $\bar{P}$, the independent variable, suggesting heteroscedasticity. While leaving the estimates of the regression coefficients unbiased, heteroscedasticity reduces their efficiency and tends to bias (usually downward) estimates of the coefficient variances. A common procedure to solve the problem is to deflate the variables by a factor assumed to be proportional to the standard deviation of the residuals. Analysis of the residuals led to selecting several alternative deflators.[7] As the deflated regressions resulted in very similar estimates for the coefficients with no change in the statistical inferences, the results are presented using the original variables.

Earnings expectations appear to be rational with respect not only to the mean forecast, but also to individual forecasters. The time-series regression, $A_{jt} = \alpha_{ij} + \beta_{ij} P_{ijt} + \epsilon_{ijt}$, is estimated for

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[7] Three alternatives are used to deflate observation j in year t: (1) the absolute value of the independent variable, (2) standard deviation of the independent variable (over time), and (3) standard deviation of the residuals from company j's time-series regression (equation (3)). For a discussion of the deflation procedure, see Maddala [1977, pp. 259–268].

TABLE 3

TEST OF SYSTEMATIC ERRORS: SUMMARY STATISTICS FOR INDIVIDUAL FORECASTER TIME-SERIES REGRESSION $[A_{jt} = \alpha_{ij} + \beta_{ij}P_{ijt} + \epsilon_{ijt}]$

	α	β	R^2	DW	$F(H: \alpha=0, \beta=1)$*
Mean ($n=87$)	0.005	1.080	0.690	1.84	1.380
First Quartile	−0.710	0.860	0.544	1.53	0.340
Median	0.000	1.050	0.709	1.79	0.810
Third Quartile	0.730	1.180	0.901	2.11	1.700

* The critical F-values in most regressions ($\nu_1=2$, $\nu_2=6$) are 5.14 (five percent significance level) and 10.90 (one percent significance level). For a description of the test, see footnote 5.

each individual forecaster (i) with at least seven annual forecasts of company j's earnings. The total number of such time-series (of forecaster-company) is 87. The summary statistics reported in Table 3 suggest that individual forecasts are unbiased. The null hypothesis of $\alpha=0$, $\beta=1$, was rejected at the five percent significance level in only 4.6 percent of the cases (i.e., 4/87).

The test of unbiasedness is only a partial test of rationality; in addition to being unbiased, rational earnings forecasts also should incorporate all relevant information available at the time of the forecast. This information is likely to include the history of earnings, forecasts, forecast errors, and exogenous information. For instance, Beaver, Lambert and Morse [1980] find that current returns have predictive power with respect to future earnings. Given the wide range of systematic patterns that may influence a time-series, it is not feasible to test whether a particular set of earnings expectations uses *all* the information embodied in the earnings time-series. However, a test is conducted here of the degree to which analysts' forecasts exploit the time-series properties and the cross-sectional relationship of earnings, as captured by two naive prediction models. The two models are

$$P_t = A_{t-1} + C_t \qquad (5a)$$

and

$$P_t = A_{t-1} + \gamma_t + \delta_t \Delta A_{mt}, \qquad (5b)$$

where A_t is the realized earnings, P_t is the expected (predicted) value of A_t, C_t is the (arithmetic) average change in EPS, computed over the years t-6 to t-1, γ_t and δ_t are regression parameters, and ΔA_{mt} is the change in market earnings. A_m is represented by the weighted average of EPS of the S&P's Composite 500.[8] The regression coefficients are re-estimated each year from the available past annual EPS data (the first available year is 1960). Note, however, that incorporation of realized ΔA_{mt} in 5(b) makes that model, strictly speaking, an *ex post* one.

The first model, a submartingale, was found by recent studies to represent quite adequately the time-series behavior of annual earnings (see Albrecht, Lookabill and McKeown [1977] and Watts and Leftwich [1977]). Furthermore, as a general representative firm-model, the martingale with drift was found to perform as well as the firm-specific Box-Jenkins models in describing the time-series characteristics of annual earnings

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[8] The weights are the number of shares, adjusted for capitalization. This yields an earnings index of a portfolio in which an amount proportional to the market value of the equity is invested in each company. Another index that gives an equal weight to (i.e., assumes an equal investment in) each company also was constructed (based on N.Y.S.E. companies) and yielded similar results.

TABLE 4

PARTIAL CORRELATIONS BETWEEN REALIZATION AND PREDICTIONS OF DIFFERENT MODELS

Year	*Correlation Coefficient Between Realization (A) and the Prediction by:* Submartingale (X_1) Given FAF(P) ($R_{AX_1 \cdot P}$)	Index Model (X_2) Given FAF(P) ($R_{AX_2 \cdot P}$)
All Years**	−0.07	0.15
1969	−0.02	−0.11
1970	0.19	0.21
1971	−0.05	−0.05
1972	−0.07	0.37*
1973	−0.14	−0.15
1974	−0.36*	−0.33*
1975	−0.05	0.10
1976	0.05	−0.04
1977	−0.10	−0.13
1978	0.10	0.27*
1979	0.02	0.20

* Significant at the five percent significance level. The critical value of the correlation coefficient at the five percent significance level for H_0: $R=0$ and two-tail test using the Z-statistic is ±0.25 for most of the yearly samples (see Freund [1971, pp. 378–382]).

** A simple average of the 11 years.

(see Albrecht, Lookabill and McKeown [1977]). The use of the index model in (5b) is supported by the relationship that was found between the first differences in individual company earnings and an economy-wide index of earnings, such as the differences in earnings across all firms (see Ball and Brown [1968] and Gonedes [1973]).

The partial correlation between actual earnings and the naive model's prediction, given FAF, measures the extent to which FAF do not exploit the information contained in the past earnings series. This correlation is denoted by $R_{AX \cdot P}$ where A denotes the realized value, X is the prediction of the time-series model, and P is the FAF.[9] A value of $R_{AX \cdot P} \neq 0$ implies that the time-series model has some predictive power not used by financial analysts. The magnitude of $R_{AX \cdot P}$ indicates the extent of underutilization of available extrapolative information by FAF.

The partial correlation results are presented in Table 4. The coefficients of the partial correlation, $R_{AX \cdot P}$, are generally very small and close to zero; the hypothesis that their mean is zero can be rejected at the five percent significance level for only four of the 22 (11 × 2) cases. The two mean coefficients computed over the 11 years are not significantly different from zero (at the five percent significance level, using the t-test). This suggests that analysts fully exploit the time-series and cross-sectional properties of the earnings series that are captured by the two frequently used prediction models.

One important piece of information which a rational forecaster should consider is his previous forecast error. To test whether FAF fully incorporate information on past errors, the current forecast

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[9] The notations A, P, and X, as well as the results presented, are stated in terms of earnings levels. Similar results were obtained for earnings changes.

TABLE 5

TEST OF A SERIAL CORRELATION IN THE PREDICTION ERRORS: SUMMARY STATISTICS FOR COMPANY TIME-SERIES REGRESSIONS (BASED ON MEAN FORECASTS)

$[\bar{P}_{jt}-A_{jt})=\alpha_j+\beta_j(\bar{P}_{j,t-1}-A_{j,t-1})+\mu_{jt}]$

	α	β	R^2	DW	$F(H: \alpha=0,\ \beta=1)$*
Mean ($n=27$)	−0.166	0.077	0.045	1.63	0.532
First Quartile	−0.230	−0.020	0.004	1.40	0.170
Median	−0.150	0.070	0.016	1.66	0.300
Third Quartile	−0.030	0.280	0.075	1.92	1.060

* The critical F-values in most regressions ($\nu_1=2$, $\nu_2=6$) are 5.14 (five percent significance level) and 10.90 (one percent significance level). For a description of the test, see footnote 5.

error is regressed on the previous period's errors. First, time-series regressions based on the average forecast are estimated for each company j with at least seven pairs of consecutive years of forecast data:

$$\bar{P}_{jt}-A_{jt}=\alpha_j+\beta_j(\bar{P}_{j,t-1}-A_{j,t-1})+\mu_{jt}. \quad (6)$$

The hypothesis that $\alpha=0$ and $\beta=0$ is tested for each regression.[10] Summary regression results for the 27 companies with sufficient data are shown in Table 5.[11] It is apparent from the table that the coefficients are close to zero and insignificant. The hypothesis that α and β are equal to zero could not be rejected for each of the 27 companies. (The distribution of the Durbin Watson statistics suggests that autocorrelation is not a serious problem in the company regressions.) The regression based on the mean forecasts pooled across companies and years yielded $\alpha=0.011$, $\beta=0.070$, $R^2=0.03$, and an insignificant F-value in the test of the above joint hypothesis. No heteroscedasticity was detected in the residuals from this pooled regression.

The conclusion that can be drawn from the lack of serial correlation in the forecast errors is that the information contained in past forecast errors is fully used in forming predictions of future earnings. This result, coupled with the findings of unbiasedness of FAF and their full use of the time-series and cross-sectional properties of past earnings, strongly suggests that financial analysts form their forecasts of annual earnings in a manner consistent with rational expectations.

The degree of dependence of current forecast errors on the previous error is examined also in the breakdown of individual forecasters. The time-series of forecasts made by 49 forecasters (for 22 different companies) are examined with the same qualitative results. Although the F-value is significant at the five percent level in 11 (or about 22 percent) of the regressions, the sign of the coefficients is not consistent across forecasters and the median R^2 is only 0.08. Nevertheless, it appears that some forecasters do not fully incorporate information about their past errors when forming their new predictions.

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[10] Another forecast error measure, $\ln(P/A)$, also was used for the regressions with essentially similar results.

[11] Since the formulation in (6) contained lagged dependent variables, the application of OLS estimation may produce biased β's and DW values, depending on the properties of the residuals μ_{jt}. Examination of μ_{jt} reveals that for most companies and forecasters examined, μ_t's are such that only a slight bias may be present in the estimation of these parameters (a downward bias in β and, mostly, an upward bias in the DW statistic). For a detailed discussion see Johnston [1972, Ch. 10].

Less than full use of available information by some forecasters suggests that their forecasts may be improved by incorporating that information. However, underutilization by forecasters of information contained in the earnings time-series does not necessarily mean that their forecasts are less accurate than those made by efficient forecasters. Other factors such as access to inside information or analytical ability also will affect the relative accuracy of forecasts.

ADAPTIVE EXPECTATIONS

According to the adaptive forecasting hypothesis, expectations are revised so as to incorporate that portion of the most recent forecast error that is considered permanent. Similar to Brown and Rozeff [1979], the adaptive model, as it pertains to analysts' earnings forecasts, can be formulated as

$$P_t - P_{t-1} = \alpha + \beta(A_{t-1} - P_{t-1}) + \epsilon_t. \quad (7)$$

The model usually is specified without an intercept, in which case the forecast for any given year becomes an exponentially weighted average of past observations, specifically

$$P_t = \beta \sum_{i=1}^{\infty} (1-\beta)^{i-1} A_{t-i}. \quad (8)$$

As shown by Muth [1960], this forecast is the best linear forecast (in terms of squared error minimization) when the process is of the form

$$A_t = \mu_t + \beta \sum_{i=1}^{\infty} \mu_{t-i}, \quad (9)$$

where μ_t are independent random shocks, independently distributed with mean zero and variance σ^2. In other words, (8) depicts an optimal forecast if the time-series is made up of two kinds of random components, one lasting a single time period (transitory) and the other lasting for all subsequent periods (permanent).[12]

If the earnings series is believed to behave as a random walk process, the optimal forecast would be $P_t = A_{t-1}$, that is $\beta = 1$. In a recent study, Beaver, Lambert and Morse [1980] examine the information content of stock prices with respect to future earnings. They contend that while a random walk may well be the best extrapolative model, forecasting models that incorporate exogenous information may produce predictions other than those stipulated by the random walk model. Specifically, they conclude that "earnings are not perceived to be well approximated as a random walk, when viewed from the perspective of other information reflected in prices" [Beaver, Lambert and Morse, 1980, p. 26]. A similar point is made by Freeman, Ohlson and Penman [1982, pp. 639–640] who argue that the depiction of the random walk model as the best earnings predictive model "is only true in a limited sense, since a modest enlargement of the predictive information set should allow for a rejection of the hypothesis that earnings changes are unpredictable." Specifically, they show that future earnings changes can be predicted on the basis of the current book rate-of-return. Thus, the examination of the particular behavior of FAF may shed light on the earnings process perceived by analysts (and investors).

The adaptive model has been used extensively in the economic literature to describe the formation of expectations concerning future behavior of variables such as the inflation rate [Frenkel, 1975; Mussa, 1975; and Solow, 1969], farm prices [Nerlove, 1958] or permanent income [Friedman, 1957].

The notion that inflation expectations, for example, are formed in an adaptive way has considerable empirical support [Turnovsky, 1970; Lahiri, 1976; and Figlewski and Wachtel, 1981]. In two recent studies, Abdel-khalik and Espejo [1978] and Brown and Rozeff [1979] examined Value Line's revisions of quarterly and annual earnings forecasts following the disclosure of the last quarter's results. This paper, on the other hand, examines whether annual earnings forecasts are formed adaptively with respect to last year's forecast error. The examination is conducted at both the company and the individual forecaster level. As the model usually is specified without the constant term, it is tested here both with and without an intercept. However, excluding the intercept can induce a systematic error in the estimated β coefficient. Such an error may arise if other information, besides the error in predicting the most recent observation of the series, is used to form earnings expectations (e.g., existence of a trend). The inclusion of the intercept is particularly proper when the model is estimated from data pooled across companies or forecasters.

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[12] It can also be shown that the optimal prediction for the next period (which is the expected value of the permanent component) is also the optimal prediction for all future periods.

If the time-series behavior of earnings varies across companies, earnings forecasts of different companies are likely to (and, in the case of rational forecasts, must) be formed according to different processes. Even if the process of expectation formation for all firms is adaptive, the adaptation coefficient may vary cross-sectionally. Furthermore, different sets of information and different assessments of earnings behavior may lead to different ways of forecast formation by different analysts.

Variation of the adaptative coefficients across companies reduces the efficiency of cross-sectional estimation. When the process itself is not uniform across companies, a cross-sectional analysis is not very meaningful. A time-series analysis is more efficient and more likely to reveal any cross-sectional differences that may exist in the processes.

The use of mean forecasts for testing the adaptive model may bias the results against finding an adaptive behavior, even if such behavior exists. Bierwag and Grove [1966] show that if individuals form their expectations adaptively, the mean expectation does not follow an adaptive process unless the adaptive coefficient is the same for all individuals. Moreover, it is plausible that different forecasters form their expectations differently. Thus, the analysis of the adaptive behavior of analysts' forecasts is conducted here also for individual forecasters.

The first set of tests is performed for individual companies, where each company is represented by the time-series of its mean earnings forecasts. The following equation is tested for each company:

$$\bar{P}_{jt}-\bar{P}_{j,t-1}=\alpha_j+\beta_j(A_{j,t-1}-\bar{P}_{j,t-1})+\epsilon_{jt}. \quad (10)$$

This regression is estimated for each of the 36 companies that have forecast data for at least six pairs of consecutive years. Summary statistics are presented in Table 6. The results suggest that in the vast majority of companies, the adaptive expectations model adequately represents the process by which earnings forecasts are formed; the R^2 values are high (an average of 0.622), the average adaptive coefficient across companies is 0.962, and it is significant in 30 of the 36 regressions. The Durbin Watson statistic is within the critical range for all companies, indicating no autocorrelated disturbances in the estimation of their time-series. Except for two companies, the adaptive coefficients are positive; most of them lie between zero and one and only three are significantly greater than one at the five percent level.

The intercept appears to be important

TABLE 6

SUMMARY STATISTICS FOR THE ADAPTIVE MODEL ESTIMATED FOR INDIVIDUAL COMPANIES
(BASED ON MEAN FORECASTS)
$[\bar{P}_{jt} - \bar{P}_{j,t-1}) = \alpha_j + \beta_j(A_{j,t-1} - \bar{P}_{j,t-1}) + \epsilon_{jt}]$

	α	$t(\alpha)$	β	$t(\beta)$	DW	R^2
Mean ($n=36$)	0.692	3.600	0.962	4.387	1.93	0.622
First Quartile	0.300	1.440	0.710	2.125	1.49	0.479
Median	0.410	2.710	0.850	3.885	1.96	0.688
Third Quartile	0.570	4.765	1.290	5.435	2.35	0.831

in explaining expectations behavior; it is significant (five percent level) in 23 of 36 companies, suggesting that the specification of the model with an intercept is appropriate for this analysis.[13]

The fact that the adaptation coefficient for more than 60 percent of the companies was below one may imply that the earnings process of most companies is perceived by analysts as being different from a random walk. If analysts are rational, this finding suggests that while the random walk may be a general representative model of earnings behavior (indeed, the mean adaptation coefficient is close to one), the earnings of some companies cannot be a pure random walk. In fact, the notion that the random walk model is not universal is echoed in the works of Brooks and Buckmaster [1976], Lieber, Melnik and Ronen [1983], and Hopwood, McKeown and Newbold [1982]. The first two studies find that for some periods and companies, the earnings behavior can be described by a mean reverting process, while the latter shows that a random walk model for annual earnings is inferior to models based on judicious aggregation of quarterly data.

It is instructive to note that when the adaptive model is estimated from the pooled data so that the coefficients are restricted to be constant across all companies, the value of the adaptive coefficient is only 0.718 and the R^2 only 0.09 (compared with averages of 0.962 and 0.622, respectively, for individual companies). This indicates important variations in the coefficients across companies. Indeed, the null hypothesis H_0: $\alpha_j = \alpha$, $\beta_j = \beta$ for every j was rejected at the one percent significance level (using the F test). The same result was obtained when only the slope coefficient was restricted and the intercept was allowed to vary across companies. The restriction of an equal coefficient across companies, which is a feature of cross-sectional tests, thus might have led to the low explanatory power of the regressions used by Brown and Rozeff [1979, Table 1].

Our examination of the adaptive model thus far has relied on consensus (mean) forecasts. Of special interest is the behavior of individual forecasters involved

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[13] The finding of a significant intercept contrasts with the results reported by Brown and Rozeff [1979] who find a small and insignificant intercept in most of their runs [Table 1]. While the variance between the results may be explained by sample and design differences (Brown and Rozeff use only five years and one forecaster and employ a pooled cross-sectional regression), it may also be due to the fact that Brown and Rozeff test quarterly rather than the annual earnings predictions (and revisions). Since the intercept captures, among other elements, expected trend, it is plausible that its impact becomes more pronounced for the longer horizon of annual forecasts. Moreover, the use of pooled samples of quarterly observations, each relating to a different seasonal pattern, might have further suppressed the significance of the quarter-to-quarter trend.

TABLE 7

SUMMARY STATISTICS FOR THE ADAPTIVE MODEL ESTIMATED FOR INDIVIDUAL FORECASTERS

$[P_{ijt} - P_{ij,t-1} = \alpha_{ij} + \beta_{ij}(A_{j,t-1} - P_{ij,t-1}) + \epsilon_{ijt}]$

	α	$t(\alpha)$	β	$t(\beta)$	DW	R^2
Mean ($n=49$)	1.001	2.891	1.095	3.550	1.97	0.512
First Quartile	0.350	1.350	0.520	1.190	1.51	0.169
Median	0.530	2.100	0.950	2.990	1.96	0.591
Third Quartile	1.370	3.280	1.460	5.170	2.37	0.811

in the earnings prediction of the same company. To examine the adaptive behavior of individual forecasters, the adaptive model of the form

$$P_{ijt} - P_{ij,t-1} = \alpha_{ij} + \beta_{ij}(A_{j,t-1} - P_{ij,t-1}) + \epsilon_{ij,t} \tag{11}$$

(i is the forecaster's index) is estimated in each company for any forecaster that has forecast in at least six pairs of consecutive years. The distributions of the regression statistics are shown in Table 7. The results in terms of the magnitude and significance of the coefficients are similar to those obtained for the company regressions. However, while significant differences were found between companies, insignificant differences were obtained in the coefficients of the adaptive model between individual forecasters of the same company. The null hypothesis of no significant differences between forecasters of the same company was rejected (at a five percent level) for only one of the 18 companies examined.[14] This finding is consistent with rational formation of earnings expectations by financial analysts, who produce forecasts which are attuned to the unique time-series behavior of the earnings of each company. This finding also suggests that the use of a single forecaster (e.g., Value Line) by previous studies has not invalidated their general conclusions concerning the formation of earnings expectations.

The adaptation coefficient depends on the degree to which the cause of the most recent forecast error is viewed as permanent. Since such an assessment depends on the nature of economy-wide shocks and their interpretation by individuals, among other things, the individual companies' coefficients might be time-dependent. Theoretically, the adaptive model may have a different coefficient in each year and for every company, but such a model could not be estimated for lack of observations. However, the mean coefficient across companies can be estimated each year, and a test can be conducted for the equality of the means.

The results of the ten annual cross-sectional regressions (pertaining to the years 1970–1979), each of which is based on the companies' mean forecasts (the company sample is identical in all ten years), show positive and (in nine of the ten regressions) significant adaptive coefficients. When tested jointly, the difference in both coefficients between years is significant (using the F-test). However, when the test is conducted only for the slope, and the intercept in the constrained regression is allowed to vary over years, the test shows no significant difference in the slope coefficient between years.

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[14] The F-statistic was employed for each company (see footnote 5). The unconstrained sum of squares of the residuals was computed as the sum of residuals from the different regressions for individual forecasters of that company, while the constrained sum of squares was computed from that company's regression (based on the yearly mean forecasts).

CONCLUDING REMARKS

Market processes are typically sensitive to the way expectations are influenced by the actual course of events. Furthermore, it is often necessary to make sensible predictions about the way expectations would change when either the amount of available information or the structure of the system is changed. Therefore, it is important to understand what kind of information is used and how it is put together to frame an estimate of future earnings.

This paper provides evidence that annual earnings forecasts by financial analysts are formed in a rational manner in the sense that they incorporate available information in the forecasts. The time-series employed by some of the tests were short—only 11 years of earnings and forecast data. Although the rationality tests exhibited consistent results over time, the coefficients of the adaptive models showed significant variability over the years. Longer time-series may enable a more concise assessment for the stationarity of the model over time.

The rationality tests related to a fairly narrow set of information—that contained in the past history of the earnings series. The results, however, indicate that additional information, specifically economy-wide trends in earnings, also is incorporated properly in the earnings forecasts of analysts. An interesting extension of this work would be to examine the degree to which other relevant information is impounded in earnings forecasts. In particular, in light of the findings by Beaver, Lambert and Morse [1979] and Freeman, Ohlson and Penman [1982], it would be interesting to examine whether analysts are acting as if they use security price or book rate-of-return to extract information regarding future earnings.

The adaptive expectations model, which has been shown to characterize the formation of other important economic variables (e.g., inflation [Turnovsky, 1970] and quarterly earnings [Brown and Rozeff, 1979]), also appears to describe adequately the manner by which annual earnings forecasts are constructed. The finding of similar adaptive behavior among different forecasters of the same company and heterogeneous behavior of forecasts made for different companies may reflect the degree of correlation between independent information possessed by individual forecasters, as well as the varying earnings-generating processes of different companies. A formal model of earnings expectations formation may be necessary to explain these findings. The adaptive process may not be the only one that can describe adequately the formation of earnings expectations. Other processes, sometimes combined with the adaptive process, have been tested in the economic literature and may be examined in the context of earnings forecasts.

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An Empirical Study of Error Characteristics in Accounting Populations

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ABSTRACT: This paper reports the error characteristics of five accounting categories using a new data set consisting of errors discovered during the audits of 20 companies throughout five years. The shape and variability of error amount distributions are described as well as the magnitude, direction, and types of errors making up these distributions. Four error rates are defined and their distributions presented and analyzed. Finally, three environmental factors (accounting category, industry, and firm-specific characteristics) are investigated for their impact on errors and error rates. In addition, the effect of firm size on error rates is tested.

MANY relationships within the auditing environment are not well understood, primarily due to the paucity of appropriate data on critical elements within this environment. In particular, little is known about financial accounting errors, and a recent auditing conference has identified the analysis of error characteristics to be an area in which research is urgently needed [Felix, Leslie and Neter, 1982]. There are numerous accounting and auditing issues, such as inherent risk and extent of testing, which cannot be addressed properly without information on accounting errors. The goal of this study is to increase the profession's knowledge of accounting errors by investigating the error characteristics of five accounting categories using a new data set.

Major contributions to existing knowledge about error characteristics have been made by Neter and Loebbecke [1975], Leslie [1977], Ramage, Krieger and Spero [1979], Johnson, Leitch and Neter [1981] and Hylas and Ashton [1982]. This study expands upon previous work in two important directions. First, we examine errors in accounts payable, purchases, sales, accounts receivable and inventory; previous studies have had access to data on only the latter two categories. Second,

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we calculate four error rates to describe error characteristics. Past studies have focused on error frequency (in terms of the number of times errors occurred in a sample) and taintings (the proportion of a dollar unit that is in error). In addition to calculating these two rates, we also analyze the proportion of dollar units in error and total discovered error amount as a proportion of the recorded value of the sample. We included these additional rates because, in combination with taintings, they should prove important decision aids for auditors. The auditor may compare these rates to some tolerable error level as described in Statement on Auditing Standards Number 39 (SAS 39) [AICPA, 1981] in assessing the effectiveness of an internal control system and in determining whether financial statements are fairly presented.

The paper is divided into five sections. We describe our data in Section I. In Section II we examine error amounts to describe the direction and magnitude of errors, and the shape and variability of their distributions. We also analyze which error types are the most frequent and individually significant.

In Sections II and III we test whether accounting category, firm characteristics, and/or a firm's industry have an effect on error amounts and error rates, respectively. The influence of firm size on error rates is also examined in Section III. Our findings and conclusions are summarized in Section IV.

I. THE DATA BASE

Limited data on accounting errors are available to researchers. Therefore, one of the principal contributions of this study is to provide a description of error characteristics for a new data set. The data set used in this study has two important features. First, we had considerable control over the data collection process.[1] Since we had direct access to audit files, we have been able to examine factors that were unavailable to previous studies. Second, our data set is from a new source, Price Waterhouse, while three previous studies are based on two data sets provided by Peat, Marwick, Mitchell & Co. [Johnson, Leitch and Neter, 1981; Hylas and Ashton, 1982; and Ramage, Krieger and Spero, 1979].

The data are from the audit files of five annual audits[2] for each of 20 companies selected by Price Waterhouse.[3] Of these 20 companies, all but one is privately owned, 11 are from the manufacturing sector, four are from the service industry, and five are from the distributing industry. The net sales of these companies ranges from \$1 million to \$216 million.[4] Table 1 provides a breakdown of their size and industries. All audit testing done throughout a company's fiscal year at any location was considered to be part of one audit. Information from the audits of

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[1] Our control over the data collection process consisted of designing the data questionnaire and physically being present to supervise and answer the questions of the audit staff who collected the data with us.

[2] In using a data set consisting of repeated observations from the same 20 firms (panel data), we must assume first that errors within a given year for a firm are independent, and second that errors between years for a firm are independent. The first assumption has been used uniformly in previous studies, and is standard for empirical studies using cross-section data. The second assumption is essentially a weaker form of the first and is generally employed in economic studies using panel data. The common practice is to pool the data across firms or individuals and estimate a fixed-effect model. (See, for example, Judge, et al. [1980, Chapter 8]). In a fixed-effect model, it is assumed that error terms are independent after allowing for an individual mean or constant. Despite the fact that the above assumptions are common in applied work, they are restrictive and the results reported below should be considered approximate.

[3] Price Waterhouse judgmentally selected the clients with the objective of providing a representative set of audits within the stated industries.

[4] The size category for all but three firms changed over the course of the five years using either total assets or net sales to define client size. As a result, we could not test the hypothesis that error rate means within a size category are equal in the analyses performed below.

TABLE 1

NUMBER OF AUDITS USED IN THIS STUDY CATEGORIZED BY INDUSTRY AND FIRM SIZE

Client Size / *Client Industry*	*Net Sales (Million Dollars)*					
	<$10	*$10 to $19*	*$20 to $29*	*$30 to $50*	*>$50*	*Total*
Service 4 Companies	17	3				20
Distribution 5 Companies	5	1	2	6	11	25
Manufacturing 11 Companies	5	15	14	15	6	55
TOTAL	27	19	16	21	17	100

subsidiaries was included in the data of the consolidated entity and was considered to be part of one audit.

Observations are from the cash, accounts receivable, accounts payable, inventory, purchases, and sales sections of audit files as they relate to the five accounting categories being examined in this study. All testing in these audits was performed on samples which were judgmentally determined and selected by the auditor. Compliance testing of the system of internal accounting controls surrounding accounts payable and accounts receivable was the primary objective of the testing in the purchases and sales audit sections, respectively. As a result, many of the errors noted in purchases and sales concern qualitative factors, such as appropriate transaction authorization, which only have an indirect effect on monetary errors. Such errors were noted, but no direct monetary effect was recorded.[5] Substantive testing of year-end account balances was the focus of testing in the accounts receivable, accounts payable, and inventory audit sections.

In collecting observations of monetary errors, we defined the value of the error as the book value of an item minus its audit value. The book value is the amount originally recorded for that item, while the audit value is the amount deemed by the auditor to be the correct value for that item. An overstatement error is therefore a positive amount while an understatement error is a negative amount. Each error noted in the audit files, regardless of dollar amount, was recorded as an observation and classified by error type.

We used all possible observations in calculating error rates[6] and the results presented below are based on the full sample. This approach differs from previous research in two ways. First, past studies exclude audits with zero or few errors and thus report results conditional on the presence of errors. In this study, we report the probability of errors being present and expected (unconditional) error rates. Second, our data consist of all errors noted in a given audit relating to the five accounting categories regardless of their amount or whether or not an item resulted in an adjustment to the financial statements. It would appear that the data used in previous studies consisted of observations of adjusted items [Ramage, Krieger and Spero, 1979, p. 74]. Since, to our knowledge, there is no theoretical basis on which to distinguish between adjusted and unadjusted items, we feel our data provide additional information on error characteristics.

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[5] Rate One (described in Section III) for the purchases and sales populations includes compliance test errors.

[6] In some cases, there was incomplete information about an observation. Where the missing data were vital to a specific calculation, the observation had to be dropped from the sample for that calculation. In a number of cases, there was information only on the error with no related information on book or audit values. For such observations, two rate calculations could not be performed. Two error rate calculations could not be performed for the purchases and sales accounting categories because there was no information on the dollar value of the samples.

In interpreting the results that follow, caution must be exercised in generalizing to the audit environment as a whole for several reasons. First, Price Waterhouse clients may differ systematically from clients of other accounting firms. Second, many of the clients selected were small or medium sized private companies and extrapolation of the results to large, public companies may be inappropriate. Third, differences may arise from the type of testing performed by, and audit approach of, Price Waterhouse.[7] Finally, the results of this study may differ from those of previous studies simply because of differences in the samples analyzed.

II. DISTRIBUTIONS OF ERROR AMOUNTS

In this section we examine error amounts in order to describe certain error characteristics of five accounting categories. Specifically, we investigate whether errors tend to be overstatements or understatements, relative error magnitude and variability, the shape of error distributions, and the types of errors that occur. Finally, we perform analysis of variance tests to determine whether accounting category, firm-specific effects, or industry-specific effects are important factors affecting errors.

Since there does not appear to be any heterogeneity across years for these companies, the data are pooled across years by company and accounting category to obtain sufficient observations to perform the analyses that follow.

Direction of Errors

As noted by Johnson, Leitch and Neter [1981] and Arens and Loebbecke [1976, p. 450], a fairly common assumption made by auditors is that assets and revenue errors are likely to be overstatements while liability and expense errors are likely to be understatements. In Table 2, first we summarize the number of overstatement and understatement errors observed for each of the five accounting categories respectively. Consistent with the results of both the Johnson, Leitch and Neter [1981] and Ramage, Krieger and Spero [1979] studies, our data indicate that detected accounts receivable errors tend to be overstatement errors while detected inventory errors are fairly evenly balanced between understatements and overstatements. Detected accounts payable and purchases errors tend to be understatements while detected sales errors tend to be overstatements for our data. Thus, with the exception of the inventory category, our data confirm the above assumption in terms of incidence of overstatements and understatements.

However, in addition to error incidence, auditors are also concerned with the dollar value of errors. Accordingly, we calculated the mean error for each

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[7] Since the data are derived from judgmentally selected samples, there may be a problem of sample selection bias in the empirical results presented below. We did not have data on items not selected for investigation and thus could not estimate the probability of an item being selected. This in turn prevented us from using the work of Heckman [1979] to correct for possible selection bias or to examine any possible biases resulting from this sampling scheme. It is interesting to note that many of our results are quite similar to those obtained by other researchers using random samples.

TABLE 2

DIRECTION OF ERRORS

	Inventory		*Accounts Receivable*		*Accounts Payable*		*Purchases*		*Sales*	
Number Of:	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*
Overstatement Errors	352	55	275	72	225	36	15	33	67	78
Understatement Errors	284	45	109	28	380	61	31	67	19	22
Classification Errors*	—	—	2	—	22	3	—	—	—	—
Total Number of Errors	636	100	386	100	627	100	46	100	86	100
Sign of Net Mean Error:										
Positive	5	29	13	65	8	40	3	38	6	55
Negative	12	71	7	35	12	60	5	62	5	45
Total	17	100	20	100	20	100	8	100	11	100

Note: Three clients in the service industry have no inventory. Twelve companies have no purchases monetary errors and nine companies have no sales monetary errors over the five-year period.

* These are items whose Book and Audit Values are equal (and thus the error equals zero), but which have been charged to the wrong account.

accounting category of each company in which errors were observed; detailed statistics are contained in Appendix I. In Table 2 we summarize the results in terms of the frequency of positive versus negative means by company for each of the five accounting categories. It is evident that the inventory understatement errors in our data are larger on average than the overstatement errors. Specifically, 71 percent of the companies have negative inventory error means, a result contrary to common expectations. Further, the results in Table 2 indicate that a surprising proportion of the dollar value of accounts receivable[8] and sales errors are attributable to understatements, while a significant proportion of the dollar value of accounts payable and purchases errors are attributable to overstatements. Further research is needed to clarify these issues.

Error Magnitude

Next we investigate whether there is any consistent tendency for net error magnitude to differ between accounting categories. For each company, we ranked from largest (Rank 1) to smallest (Rank 5) the absolute values of the mean net errors of each accounting category.[9] The re-

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[8] The result is contrary to the finding of Johnson, Leitch and Neter [1981] where all accounts receivable means are positive. This difference may be due to the fact that while our data consist of both adjusted and unadjusted errors, the data used in the Johnson, Leitch and Neter [1981] study consisted of adjusted errors only. An adjusted error is an auditor-proposed correction of the client's financial statements which is agreed to by the client and booked prior to the issuance of the financial statements. Auditors may not suggest that clients adjust accounts receivable balances when they are understated, and thus the Johnson, Leitch and Neter [1981] data did not indicate the presence of such errors. Alternatively, it is possible that these results may reflect characteristics common to private companies whose practices, since they are not reporting to the general public, may be different than those of public companies.

[9] In this analysis we are simulating a fairly common audit practice in which all errors found in an audit are tabulated to determine their cumulative net effect on balance sheet and income statement line items. Depending on the auditor's definition of materiality, an adjustment to the financial statements would be proposed if the cumulative effect of overstatements or understatements is sufficiently large.

TABLE 3
RELATIVE MAGNITUDE OF MEAN ERRORS IN ABSOLUTE DOLLARS

	Inventory			*Accounts Receivable*			*Accounts Payable*			*Purchases*			*Sales*		
Rank	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*
(1) (Largest)	4	24	24	8	40	40	6	30	30	1	13	13	1	9	9
(2)	4	24	48	8	40	80	4	20	50	3	37	50	1	9	18
(3)	6	35	83	3	15	95	6	30	80	—	—	50	2	18	36
(4)	3	18	100	1	5	100	2	10	90	1	13	63	5	45	81
(5) (Smallest)	—	—	100	—	—	100	2	10	100	3	37	100	2	18	100
	17*	100		20	100		20	100		8*	100		11*	100	
Mean Rank	2.5			1.9			2.5			3.1			3.1		

Note: As an example of this ranking process we show the means and their ranks for company 8:

	Inventory	*Accounts Receivable*	*Accounts Payable*	*Purchases*	*Sales*
Mean	−$59,601	−$72,180	$5,440	−$6,066	$10,285
Rank	2	1	5	4	3

* Three clients in the service industry have no inventory. Twelve companies have no purchases monetary errors and nine companies have no sales monetary errors over the five-year period.

sults of this comparison are in Table 3. Consistent with Johnson, Leitch and Neter [1981], we find that accounts receivable errors are, on average, larger than inventory errors. Further, accounts receivable errors generally are larger than errors in the other four accounting categories. This result may be due to the relative absence of offsetting errors within this accounting category.

Error Variability

Next we compare the variability of the error distributions of each accounting category. Since there were insufficient observations of purchases and sales errors, we restrict this analysis to the inventory, accounts receivable, and accounts payable accounting categories. To determine if the errors of any one accounting category are more highly variable than the errors of the other accounting categories, we rank from largest (Rank 1) to smallest (Rank 3) the standard deviations of the error distributions of each accounting category for each company. The results are in Table 4 and do not provide any evidence that the errors of one accounting category vary more than the errors of the other accounting categories. All of the distributions are characterized by a high degree of variability, and in most cases the sample standard deviation is considerably larger than the sample mean.

Shapes of Error Amount Distributions

Next we investigate the shape of the error distributions to determine if error amounts are normally distributed as assumed by some researchers (e.g., Felix and Grimlund [1977]). In the analyses

TABLE 4
RELATIVE DEGREE OF VARIABILITY

	Inventory			*Accounts Receivable*			*Accounts Payable*		
Rank	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*
1 (Greatest)	6	35	35	8	40	40	6	30	30
2	6	35	70	5	25	65	9	45	75
3 (Smallest)	5	30	100	7	35	100	5	25	100
	17	100		20	100		20	100	
Mean Rank	1.9			2.0			2.0		

that follow, again we exclude the purchases and sales categories because there are too few observations per company to obtain reliable results.

For each error distribution of each accounting category of each company we calculate a Kolmogorov D-statistic to test the null hypothesis that error amounts are normally distributed. In all but two cases the null hypothesis of normality can be rejected at the .01 level.[10] Error distributions generally are skewed and kurtotic. Inventory and accounts payable error distributions are negatively skewed in 76 percent and 60 percent of the companies, respectively, consistent with the signs of the means described earlier. Accounts receivable error distributions are positively skewed 55 percent of the time.

Types of Errors

In determining the extent and type of audit testing to be performed, it is important for the auditor to know what kinds of errors are likely to occur in a given accounting category and whether such errors tend to be large or small in dollar amount. From an auditor's perspective, error types which are individually large in dollar amount and which occur in large numbers would be of greatest concern. In Table 5 we summarize the frequency and absolute dollar magnitude of error types which occurred in each of the five accounting categories of our sample. Cutoff errors occur the most frequently and represent the largest proportion of dollar error in the accounts receivable and accounts payable accounting categories. For inventory, pricing errors occur the most frequently, but such errors are small in dollar amount relative to cutoff errors, the largest inventory errors in terms of dollar amount.

Environmental Factors Affecting Errors

Next we investigate the impact of environmental factors on errors. We limit our investigation to three factors which might affect errors: accounting category, individual companies, and industry.

To determine if these factors have significant explanatory impact, we adopt an analysis of variance or regression framework. In using the analysis of variance technique we face two problems. One is

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[10] The null hypothesis of normality could be rejected at the three percent level in one case and the nine percent level in another.

TABLE 5

TYPES OF ERRORS

A. The Number of Observations of each Error Type

	Inventory		*Accounts Receivable*		*Accounts Payable*		*Purchases*		*Sales*	
	#	%	#	%	#	%	#	%	#	%
Cutoff	117	18	156	40	374	60	12	26	7	8
Perpetual Inventory	37	6	—	—	—	—	—	—	—	—
Pricing & Valuation	321	50	84	22	4	—	—	—	—	—
Mechanical	39	6	21	5	35	6	8	17	13	15
Other	122	20	125	33	214	34	26	57	66	77
Total	636	100	386	100	627	100	46	100	86	100

B. Total Absolute Error Amount ($000)

	$	%	$	%	$	%	$	%	$	%
Cutoff	6,148	40	7,288	68	12,787	84	148	9	41	11
Perpetual Inventory	2,865	18	—	—	—	—	—	—	—	—
Pricing & Valuation	2,846	18	953	9	8	—	—	—	—	—
Mechanical	1,141	7	157	1	125	1	18	1	37	10
Other	2,571	17	2,315	22	2,268	15	1,446	90	284	79
	15,577	100	10,713	100	15,188	100	1,612	100	362	100

that analysis of variance assumes common variance across groups, and this may not be the case for our data. To allow for this possibility, we divide both the dependent and independent variables by the standard deviation of the accounting category for that company.[11] Another problem is that analysis of variance assumes that the residuals are normally distributed, and in the previous section we demonstrate that this is not the case. While Hayes [1973, p. 481] indicates that given sufficient observations the lack of normality in the residuals may not be a serious problem, the results of the following tests should be considered approxi-

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[11] Consider the following example. There are data on errors for two companies within an accounting population. We wish to test the hypothesis that errors have the same mean across companies. Therefore we test whether $\mu_1 = \mu_2$ using an F-test for the following equation:

$$x_i = \mu_1 D_{1i} + \mu_2 D_{2i} + \epsilon_i$$

where D_{1i} is a dummy variable coded one if the errors come from company one and coded zero otherwise, where D_{2i} is a dummy variable coded one if the errors are from company two and coded zero otherwise. (Thus μ_1 is the mean for company one errors while μ_2 is the mean for errors from company two.) However, if variance $(\epsilon_{i1}) = \sigma_1^2$ and variance $(\epsilon_{i2}) = \sigma_2^2$, ordinary least squares will produce inconsistent test statistics. On the other hand, if we estimate the equation

$$\frac{x_i}{\sigma_i} = \mu_1 \frac{D_{1i}}{\sigma_i} + \mu_2 \frac{D_{2i}}{\sigma_i} + \frac{\epsilon_i}{\sigma_i}$$

where $\sigma_i = \sigma_1$ if x_i is from company one and $\sigma_i = \sigma_2$ if x_i is mate. Due to insufficient observations, we exclude purchases and sales from the analysis.

First we test the null hypothesis that the means of the accounting categories are equal. We reject this hypothesis at the .01 level, as indicated in Table 6. Given that accounting categories have their own distributions, we perform the other tests for each accounting category separately.

In sections 2 to 4 of Table 6 we test whether individual firms or their industry influence errors. The hypothesis that, within an accounting category, error means do not differ across industries, is tested in Section 2. At standard confidence levels, this hypothesis cannot be rejected for errors in any accounting category. In Section 3 we test whether error means do not differ across firms within an accounting category. This hypothesis can be rejected at the one percent level for accounts payable and the five percent level for accounts receivable. Finally, since allowing for industry means is a special case of allowing for firm means, in Section 4 we test whether using only industry means is overly restrictive. The hypothesis that industry means are sufficient can be rejected for both the accounts payable and accounts receivable categories.

In summary, we find that accounting categories have their own error distributions. For inventory errors we find little evidence of firm or industry influence. For accounts receivable and accounts payable errors there are individual firm effects which do not simply represent industry differences.

III. ERROR RATES

In determining whether the financial statements are fairly stated, or whether the internal control system is effective, the auditor compares actual error to some tolerable error level [AICPA, 1981]. In making this comparison, the auditor may use either simple aggregate error or the total error as a proportion of an overall amount. Proportional error may be defined in two ways: 1) the incidence of errors relative to the number of items in a sample or a population, or 2) the error amount as a percentage of the dollar value of the sample or account balance. In this section, we define several error rates, provide summary statistics for the distributions of these rates, and investigate whether four environmental factors affect these rates.

Rate One: Error Incidence

Information on error incidence is commonly tabulated by auditors during the course of interim examinations and also has been analyzed in previous studies (e.g., Johnson, Leitch and Neter [1981]). Such information is of interest because then it is possible to estimate the probability of an error occurring in an account.

We calculated the rate of error occurrence for each audit in each accounting category as follows:

$$\text{RATE ONE} = k/n,$$

where $k =$ the number of errors (including non-monetary errors) in an audit, and

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from company two, the residuals will now have a common variance. Not only will we obtain more efficient estimates, but the test statistics now will be consistent. This procedure is equivalent to using a generalized least squares approach to correct for heteroskedasticity [Judge, et al., 1980, chapter 4] and then carrying out tests on parameter restrictions using the transformed data. The validity of this latter procedure when σ_1 and σ_2 are estimated is demonstrated in Goldfeld and Quandt [1978].

In our sample, any hypothesis that was rejected using ordinary least squares also was rejected using the generalized least squares approach. However, the generalized least squares approach allowed us to reject several hypotheses that we could not reject using ordinary least squares. (The only hypotheses we could reject using ordinary least squares were that firm means within accounts payable were the same and that firm means within an industry for accounts payable were the same).

TABLE 6

RESULTS OF ANALYSIS OF VARIANCE TESTS FOR ENVIRONMENTAL FACTORS AFFECTING ERRORS

		Degrees of Freedom	
	F-Statistic	*Numerator*	*Denominator*
1. Testing for differences between accounting categories: Model 1: $x_i=\mu+\epsilon_i$ Model 2: $x_{ip}=\mu_p+\epsilon_i$ where μ_p represents the mean of an accounting category.	7.63**	2	1678
2. Testing for differences between industries: Model 2: $x_i=\mu_p+\epsilon_i$ Model 3: $x_i=\mu_{kp}+\epsilon_i$ for x_i industry k. where μ_{kp} represents an industry mean within an accounting category, p.			
Inventory	.64	2	641
Accounts Receivable	1.74	2	398
Accounts Payable	.08	2	633
3. Testing for differences between companies: Model 2: $x_i=\mu_p+\epsilon_i$ Model 4: $x_i=\mu_{cp}+\epsilon_i$ for x_i company c. where μ_{cp} represents a firm mean within an accounting category, p.			
Inventory	1.05	16	627
Accounts Receivable	1.70*	19	381
Accounts Payable	2.27**	19	616
4. Testing whether industry dummies are sufficient: Model 3: $x_i=\mu_{kp}+\epsilon_i$ for x_i from industry k. Model 4: $x_i=\mu_{cp}+\epsilon_i$ for x_i from company c.			
Inventory	1.17	14	627
Accounts Receivable	1.69*	17	381
Accounts Payable	2.52**	17	616

* Reject the null hypothesis that the means are the same at the .05 level.
** Reject the null hypothesis that the means are the same at the .01 level.

n = the number of items tested in an audit. Our findings are presented in Table 7.

Based on the evidence in Table 7, all of the distributions are quite variable, and accounts payable has the highest error incidence rate and sales has the lowest error incidence rate of the five accounting categories. Contrary to the findings from the sample analyzed by both Ramage, Krieger and Spero [1979] and Johnson, Leitch and Neter [1981, p. 272, footnote 3], the inventory category has a lower error incidence rate than accounts receivable. Further, a significant number of inventory, purchases, and sales audits had an error incidence rate of five percent or less.[12]

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[12] Previous auditing research on statistical sampling has shown that auxiliary information estimators are unreliable when Rate One is less than five percent [Frost and Tamura, 1982, p. 117].

TABLE 7

DISTRIBUTIONS OF RATE ONE: ERROR INCIDENCE

	Inventory			*Accounts Receivable*			*Accounts Payable*			*Purchases*			*Sales*		
Error Rate	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*
0	8	10	10	12	14	14	6	7	7	33	35	35	44	47	47
.000 to .025	18	23	33	2	2	16	1	1	8	8	9	44	14	15	62
.026 to .05	18	23	56	13	15	31	7	8	16	13	14	58	11	12	74
.051 to .10	20	25	81	31	35	66	13	15	31	11	12	70	15	16	90
.101 to .25	10	13	94	17	19	85	25	31	62	14	15	85	7	7	97
.251 to .50	5	6	100	5	6	91	17	20	82	10	11	96	2	2	99
.501 to .75	—	—	—	2	2	93	4	5	87	1	1	97	—	—	—
>.75	—	—	—	6	7	100	11	13	100	3	3	100	1	1	100
	79	100		88	100		84	100		93	100		94	100	
Mean	.075			.170			.337			.124			.045		
Median	.041			.071			.188			.037			.011		
Standard Deviation	.097			.280			.409			.251			.099		

Note: The above rate measures the number of errors relative to the number of items in a test sample. While there are more observations of errors for inventory than observations of errors for accounts receivable in our data set (see Table 2), the error incidence rate for inventory is smaller than that of accounts receivable because the sample sizes for inventory audits tend to be significantly larger than those for accounts receivable audits.

Rate Two: The Proportion of Net Monetary Error

While incidence of error (Rate One) provides a basis for estimating the probability of an error occurring, it does not reveal information on the dollar magnitude of the error. The auditor ultimately is concerned with the dollar amount of errors since this factor is of great consequence to the audit opinion. Therefore, we calculated a second rate, the net error amount as a proportion of the book value audited.

We calculated this rate for each audit of three accounting categories as follows:

$$\text{RATE TWO} = \frac{\sum_{i=1}^{k} (bv_i - av_i)}{\sum_{i=1}^{n} bv_i},$$

where the observations from an audit are ordered such that the first k items are in error and where n is number of items tested in an audit, k is the number of errors in an audit, and bv_i and av_i are the book value and audit value, respectively, of line item i in an audit. We were unable to calculate this rate for purchases and sales because generally the dollar value of the sample could not be ascertained. Table 8 contains summary statistics and the Rate Two distributions for the three remaining accounting categories.

From the results in Table 8 it is evident that for all three accounting categories, a significant number of observations are contained within the −.05 to .05 range. For audits in which errors were found, net monetary error tends to be understatement for inventory and accounts payable and overstatement for accounts receiv-

TABLE 8

DISTRIBUTIONS OF RATE TWO: PROPORTION OF NET MONETARY ERROR

Error Rate	Inventory #	Inventory %	Inventory Cumulative %	Accounts Receivable #	Accounts Receivable %	Accounts Receivable Cumulative %	Accounts Payable #	Accounts Payable %	Accounts Payable Cumulative %
< −.75	1	1	1	—	—	—	6	7	7
−.20 to −.75	5	8	9	2	2	2	4	4	11
−.05 to −.199	13	20	29	7	8	10	9	10	21
−.00 to −.049	13	20	49	21	22	32	25	27	48
0	8	12	61	13	14	46	8	9	57
.00 to .049	15	22	83	39	41	87	25	27	84
.05 to .199	7	10	93	11	12	99	10	11	95
.20 to .75	4	6	99	1	1	100	3	3	98
> .75	1	1	100	—	—	100	2	2	100
	67	100		94	100		92	100	
Mean	−.068			.001			−.060		
Median	0.000			.002			0.000		
Standard Deviation	.576			.082			.414		

able, consistent with the results on error amounts in Section II. However, when error amounts are related to an overall amount, such as the dollar value of a sample, it is no longer evident that accounts receivable has the highest error magnitude. To better understand the results, we decomposed Rate Two into two rates that are relevant to dollar unit sampling: taintings (Rate Three) and the incidence of dollar units in error (Rate Four).

Rate Three: The Proportion of Each Dollar Unit in Error or Tainting

The error rate described in the preceding section may be viewed as the result of a tainting process acting on recorded dollar units. This is the approach followed in selecting and evaluating dollar unit samples [Leslie, Teitlebaum and Anderson, 1979, pp. 122–123]. A tainting is defined as the error amount of a line item in error divided by the book value of the line item and is fundamental to the dollar unit sampling technique. Dollar unit sampling is becoming more widely used by practitioners and is the basis for many new statistical sampling techniques in auditing, including Bayesian and decision-theoretic methods (e.g., Cox and Snell [1979] and Menzefricke [1983], respectively). As a result, it is important to develop more exhaustive evidence on tainting characteristics.

We calculated the tainting statistic for each audit in which errors were found and where the associated book values were not equal to zero (since in this case the tainting is undefined). Because judgmental sampling based on line items, not dollar unit sampling, formed the basis for our data, we weighted each tainting by the associated book value[13] to approximate

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[13] Where a dollar unit sample has not been used, as is the case with our data and all preceding studies, there are two ways of calculating the tainting statistic for a sample. One approach is to average the taintings of the line items as follows:

$$\text{Unweighted Tainting} = \frac{\sum_{i=1}^{k} (bv_i - av_i)/bv_i}{k}.$$

the dollar unit sampling statistic as follows:

$$\text{RATE THREE} = \frac{\sum_{i=1}^{k} (bv_i - av_i)}{\sum_{i=1}^{k} bv_i},$$

where the variables are as previously defined. Table 9 presents summary statistics and the distributions of Rate Three for each accounting category.

A common assumption made by users of dollar unit sampling is that all undiscovered taintings are equal to 100 percent overstatement taintings.[14] Although there are a number of 100 percent taintings in all accounting categories except inventory, most taintings are far less than 100 percent[15] in all categories, indicating that the above assumption is quite conservative. We tested whether 100 percent taintings are associated with any particular error type and found no distinct tendency for 100 percent taintings to arise in a particular error type. However, the highest taintings are associated with the smallest book value items and taintings do show a tendency to decrease as the book value increases.

The overall findings for inventory and accounts receivable from Table 9 are consistent with those of Johnson, Leitch and Neter [1981] and the results in Section II regarding error amounts. Specifically, inventory taintings are lower than accounts receivable taintings, and accounts receivable taintings are likely to be overstatements. In our sample, accounts receivable errors tend to be associated with small book value items. For both inventory and accounts payable categories, the taintings are fairly balanced between overstatement and understatement taintings.

While taintings are important, the error process also involves the incidence of dollar units in error. We now turn to an examination of this factor.

Rate Four: The Proportion of Dollar Units Containing Error

If a dollar unit sample is being used, the proportion of the dollar units in error out of the total dollar units of the sample is the rate indicating incidence of error. Because our data are not based on dollar unit samples, we approximate this dollar unit sampling statistic by weighting Rate One by the book values (where these are not zero) of the numerator and denominator, respectively,[16] for three accounting categories as follows:

$$\text{RATE FOUR} = \frac{\sum_{i=1}^{k} bv_i}{\sum_{i=1}^{n} bv_i},$$

The other approach is to weight the taintings by the associated book values as we have done in this study.

The theory underlying dollar unit sampling focuses on individual dollar units having equal probability of being selected. The probability that an item (or dollar) will be selected is proportional to the *size* of the item (of which dollar unit is a part). The unweighted approach gives equal weight to line item taintings regardless of their size and produces, we found in calculating both rates, significantly different results. The approach used in this study, on the other hand, weights taintings by their book value and may more closely resemble probability proportional with size, consistent with dollar unit sampling theory.

Further, the large differences between the unweighted and weighted results that we found indicate that the unweighted approach may be misleading for assessing the performance of at least some dollar unit sampling techniques. For example, a new Bayesian dollar unit sampling technique proposed by Cox and Snell [1979] requires the auditor's assessment of the mean associated with the weighted average tainting and Rate Four (discussed in the next section).

[14] For example, see Leslie, Teitlebaum and Anderson [1979, p. 127].

[15] Kaplan [1975, p. 133] discusses the impact on dollar unit sampling of having taintings less than 100 percent.

[16] As noted by Ramage, Krieger and Spero [1979, p. 78], many large accounts are the result of combining small accounts. If more than one of these sub-accounts is in error, the frequency of error occurrence may be greater than one. (In fact, there were a few instances of Rate One exceeding 100 percent due to either the above effect or due to errors being discovered in testing other, but related, accounting categories). When the numerator and denominator of Rate One are weighted by their respective book values to calculate Rate Four, this effect is greatly magnified.

TABLE 9

DISTRIBUTIONS OF RATE THREE: THE PROPORTION OF EACH DOLLAR UNIT IN ERROR, OR TAINTING

	Inventory			*Accounts Receivable*			*Accounts Payable*			*Purchases*			*Sales*		
Error Rate	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*
< −.75	—	—	—	2	3	3	8	11	11	—	—	—	1	8	8
−.20 to −.75	1	2	2	2	3	6	4	5	16	—	—	—	—	—	8
−.05 to −.19	7	14	16	5	8	14	10	14	30	2	17	17	—	—	8
−.00 to −.04	13	27	43	7	12	26	13	18	48	1	8	25	7	58	66
.00 to .04	20	41	84	7	12	38	11	15	63	5	42	67	—	—	66
.05 to .19	3	6	90	10	17	55	12	16	79	—	—	67	—	—	66
.20 to .75	4	8	98	10	17	72	10	14	93	—	—	67	1	8	74
>.75	1	2	100	17	28	100	5	7	100	4	33	100	3	25	100
	49	100		60	100		73	100		12	100		12	100	
Mean	.040			.368			−.201			.322			.031		
Median	.002			.139			.005			.019			−.003		
Standard Deviation	.224			1.603			.945			.477			1.027		
Number of Observations of Errors Where the Related Book Values are Zero	46			30			167			25			1		
Number of Audits in which Such Errors were Found	17			23			36			7			1		

where n = the number of items tested in an audit, k = the number of errors in an audit, and bv = the book value of each line item, i, in an audit. Our results, summarized in Table 10, indicate that the inventory category has the highest, while accounts receivable has the lowest incidence of dollar units in error.[17]

Having examined the two components (Rate Three and Rate Four) of net monetary error (Rate Two), we propose some explanations for the Rate Two results. For both inventory and accounts payable there tended to be offsetting errors, resulting in relatively low sample taintings. Relatively low taintings reduced the effect of error incidence such that the total net monetary error was relatively low for these categories. In accounts receivable, on the other hand, the errors were predominantly overstatement errors, and with fewer offsetting errors the resulting sample taintings were higher. Further, as noted above, higher taintings tended to be associated with lower book value items (relative to the dollar value of the sample), the effect of which was a fairly low incidence of dollar units in error. Thus for accounts receivable, the effect of higher taintings was offset by relatively low incidence of dollar units in error to

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[17] It is interesting to compare the error rates in Table 10 with the non-dollar-unit-sampling counterpart, Rate One in Table 7. This comparison shows that Rate One and Rate Four may be quite different. This difference has implications for auditing standards. Auditing guidelines for assessing error rates (e.g., *SAS No. 39* [AICPA, 1981, para. 33]) may have to be differentiated for dollar unit sampling.

TABLE 10

DISTRIBUTIONS OF RATE FOUR: PROPORTION OF BOOK VALUES IN ERROR

	Inventory			*Accounts Receivable*			*Accounts Payable*		
Error Rate	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*	*#*	*%*	*Cumulative %*
0	8	18	18	13	18	18	8	10	10
.000 to .025	6	13	31	16	23	41	12	16	26
.026 to .05	2	4	35	13	18	59	3	4	30
.051 to .10	—	—	35	8	11	70	5	6	36
.101 to .25	7	16	51	4	6	76	10	13	49
.251 to .50	3	7	58	6	8	84	11	14	63
.501 to .75	5	11	69	3	5	89	9	12	75
>.75	14	31	100	8	11	100	19	25	100
	45	100		71	100		77	100	
Mean	.782			.195			.664		
Median	.228			.034			.267		
Standard Deviation	1.209			.358			1.116		

produce low net monetary error, Rate Two.

Having examined the magnitude, direction, and relationships of error rates, we turn now to an investigation of some environmental factors that might intuitively affect these error rates.

Environmental Factors Affecting Error Rates

In this section we examine the influence of four environmental factors on error rates: the accounting category, company-specific effects, a company's industry, and a company's size (in terms of net sales). To determine if these factors have significant explanatory impact, again we adopt an analysis of variance framework.[18] The results of these tests are reported in Table 11.

Accounting Category. As noted earlier, a common assumption of both auditing researchers and practitioners is that accounting categories have different distributions. To determine if error rates differ significantly between accounting categories, first we test the accounting category mean against an overall mean for each rate. We are able to reject the null hypothesis that the accounting category means are the same for all rates except Rate Two. Due to the high degree of variability in this rate, this finding should be regarded as tentative. For Rate One, this result is consistent with the finding of Ramage, Krieger and Spero [1979, p. 76], that inventory and accounts receivable distributions are different.

Firm Size. As noted by Johnson, Leitch and Neter [1981, p. 274], many auditors assume that larger firms have better internal accounting controls and thus would expect error rates to decrease as firm size increases. From the results in

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[18] Since we have a maximum of five error rate observations per company for each accounting category, there are insufficient observations to allow for possible heteroskedasticity across companies. Thus, in this analysis we are using a simple analysis of variance, regression framework on the raw data.

TABLE 11

THE EFFECT OF ENVIRONMENTAL FACTORS ON ERROR RATES

Differences between Accounting Category Means

	Rate One	*Rate Two*	*Rate Three*	*Rate Four*
F-Statistic	17.91**	.81	4.33*	6.89**
Degrees of Freedom (DF)	4/438	2/250	2/179	2/190

	Inventory		*Accounts Receivable*		*Accounts Payable*		*Purchases*		*Sales*	
	F	*DF*	*F*	*DF*	*F*	*DF*	*F*	*DF*	*F*	*DF*
SIZE: Tests size category means against an overall mean within an accounting category.										
Rate One	3.75**	4/74	1.44	4/83	1.10	4/79	1.96	4/88	1.13	4/89
Rate Two	.51	4/62	1.02	4/89	.79	4/87				
Rate Three	.71	4/44	.55	4/55	1.93	4/68				
Rate Four	.74	4/40	2.13	4/66	1.55	1/72				
INDUSTRY: Tests industry means against an overall mean within an accounting category.										
Rate One	5.25**	2/76	19.28**	2/85	2.38	2/81	3.69*	2/90	1.14	2/91
Rate Two	.16	2/64	.39	2/91	.73	2/89				
Rate Three	1.33	1/47	.66	2/57	.89	2/70				
Rate Four	1.41	2/42	4.93*	2/68	1.09	2/74				
COMPANY: Tests individual company means against an overall mean within an accounting category.										
Rate One	3.34**	16/59	5.45**	19/68	2.75**	19/64	1.98*	19/73	1.12	19/74
Rate Two	.97	14/52	.98	19/74	2.04*	19/72				
Rate Three	.75	12/36	.85	19/40	1.44	17/55				
Rate Four	1.18	11/33	2.96**	19/51	1.48	18/58				
Differences between firm means within an industry										
Rate One	2.75**	14/59	2.94**	17/68	2.69**	17/64	1.19	17/73	1.13	17/74
Rate Two	1.10	12/52	1.04	17/74	2.17*	17/72				
Rate Three	.71	11/36	.88	17/40	1.50	15/55				
Rate Four	1.11	9/33	2.50**	17/51	1.51	16/58				

Note 1: Rates Two and Four could not be calculated for purchases and sales. For these two accounting categories there were too few observations of Rate Three to enable the analyses.

Note 2: Degrees of freedom (DF) are denoted numerator/denominator.

* Reject the null hypothesis that means are the same at the .05 level.

** Reject the null hypothesis that means are the same at the .01 level.

Table 11 it would appear that firm size influences only Rate One for only the inventory category, with examination of the means showing a tendency for Rate One to decrease as the firm size increases. Except for the above case, firm size does not appear to be an important factor influencing error rates for our data.

Industry. Next we examine whether a firm's industry has an effect on error rates. The results in Table 11 indicate that a firm's industry does not appear to affect taintings or net monetary error. However, error incidence, Rate One in particular, appears to differ across industries. The evidence of industry differences for Rate One in the inventory and accounts receivable categories supports the Ramage, Krieger and Spero [1979, p. 77] result. In our sample, both error incidence rates for accounts receivable are lower in the service and manufacturing industries than in the distribution industry. For the inventory category, there is higher error incidence in the manufacturing industry than in the distribution industry. For the purchases category, the service industry has the highest error incidence.

Individual Firm Effects. Since error rates are the result of individual firms' internal control systems, next we test the null hypothesis that firm error rate means are the same within an accounting category. The monetary error rates (Rates Two and Three (do not appear to differ between firms, with the exception of Rate Two for the accounts payable accounting category. Error incidence rates, however, do appear to be affected by individual firm characteristics. For Rate One, we can reject the null hypothesis in all accounting categories except sales. We can also reject the null hypothesis for Rate Four in the accounts receivable category. Thus one reason auditors may use error incidence rates in evaluating internal accounting controls is that these rates are sensitive to individual firm characteristics.

Since we note above that there are industry differences for error incidence rates, we tested whether the above individual firm effects simply represent industry differences. The results indicate that this is the case only for Rate One for purchases. In this case, it would be sufficient to control for industry effects. In all other cases there are individual firm effects which do not simply represent industry differences.

IV. SUMMARY OF FINDINGS AND CONCLUSIONS

There are many aspects of and relationships within the auditing environment that are relatively unknown. This study has contributed to a better understanding of one element within the auditing environment, financial accounting errors. We have summarized the most important characteristics of our data into 13 points:

1. Detected accounts receivable and sales errors tend to be overstatement errors, while detected accounts payable and purchases errors tend to be understatement erors. Inventory errors tend to be evenly balanced between over- and understatement errors.
2. Due to a relative lack of offsetting errors, mean accounts receivable errors tend to be greater than the mean errors of the other accounting categories.
3. Error amounts are highly variable and are not normally distributed.
4. Cutoff errors represent the most likely source of material financial statement error for inventory, accounts receivable, and accounts payable. They were found to be both individually large and relatively frequent in the accounts receivable, inventory, and accounts payable categories. Such errors accounted for a large proportion of the total error, particularly for accounts receivable and accounts payable.
5. The distributions of inventory, accounts receivable, and accounts payable errors are significantly different. Accounts receivable and accounts payable errors are affected by individual firm characteristics which do not simply represent industry differences.
6. The accounts payable category has the highest number of errors in relation to the number of items tested. The rate of error incidence is higher for accounts receivable than for inventory.
7. Accounts receivable taintings are larger than the taintings of the other four accounting categories,

primarily due to the relative lack of offsetting errors within this category. Inventory taintings are the smallest.

8. While 100 percent taintings are not associated with a particular error type, the highest taintings are associated with the smallest book value items. Taintings tend to decrease as book value size increases.
9. The incidence of dollar units in error in relation to the total dollar units in the sample is highest in the inventory category and lowest in the accounts receivable category.
10. Error rates differ significantly between accounting categories except for the proportion of net monetary error (Rate Two).
11. Firm size has no significant impact on error rates except for inventory error incidence, where the error rate decreases as the firm size increases.
12. Industry has a significant impact on error incidence in the purchases category.
13. There are firm-specific effects, which do not simply represent industry differences, affecting error incidence (Rate One) for accounts receivable, inventory and accounts payable, net monetary error (Rate Two) for accounts payable, and the incidence of dollar units in error (Rate Four) for accounts receivable.

APPENDIX A

MEANS AND STANDARD DEVIATIONS OF ERROR AMOUNT DISTRIBUTIONS

Client	*Inventory*	*N*	*Accounts Receivable*	*N*	*Accounts Payable*	*N*	*Purchases*	*N*	*Sales*	*N*
Manufacturing Industry										
1	−6470 (16357)	42	2130 (7417)	31	−2527 (14589)	49			2711 (3320)	25
2	−5792 (23031)	31	38135 (52275)	20	727 (13374)	16	−81201 (157023)	12		
4	−2607 (24657)	28	−2795 (32855)	24	−6806 (27961)	37			−112 (5810)	31
5	919 (12841)	118	12556 (46710)	28	−39573 (119944)	16				
8	−59601 (216810)	21	−72180 (336471)	15	5440 (12115)	42	−6066 (14218)	6	10285 (21887)	6
11	−18961 (84679)	18	11491 (17715)	10	9723 (39266)	25	2500 (5000)	4	12 (27)	5
13	47980 (234428)	14	71124 (435538)	10	11834 (51315)	16			1792 (2903)	9
16	7451 (32330)	24	8177 (18072)	35	−4616 (37762)	65	−356 (795)	5	−6164 (8470)	8
17	−123457 (565232)	21	4817 (9177)	13	−4653 (11584)	10			−2215 (4953)	5
18	−1334 (25054)	102	15504 (43139)	12	−12706 (25746)	34	14788 (36207)	6		
20	−731 (5168)	19	5400 (12075)	5	29008 (129384)	23				

APPENDIX A—*(Continued)*

Client	*Inventory*	*N*	*Accounts Receivable*	*N*	*Accounts Payable*	*N*	*Purchases*	*N*	*Sales*	*N*
Service Industry										
7	-1815 (3668)	6	2701 (21124)	11	28500 (45694)	15	-3361 (11686)	8	-299 (640)	7
9	*		-28363 (133251)	19	-19963 (102865)	32				
10	*		-24736 (87722)	18	-8004 (35680)	106				
19	*		-340 (13482)	27	-432 (3182)	10				
Distribution Industry										
3	-6224 (36021)	49	1514 (19434)	35	-2307 (30579)	32			-80 (179)	5
6	-20596 (229922)	23	-26753 (116304)	17	-123449 (470929)	32			412 (928)	6
12	-1537 (101628)	26	20764 (58555)	44	2038 (18674)	32	-20128 (60745)	19		
14	732 (26184)	86	4556 (21909)	21	-975 (10919)	27				
15	4680 (30805)	16	-4201 (10154)	6	440 (40379)	17	582 (1152)	7	6374 (11343)	8

Note: Twelve companies have no purchases monetary errors and nine companies have no sales monetary errors over the five-year period.

* These clients in the Service Industry have no Inventory.

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Stock Market Behavior and Tax Rule Changes: The Case of the Disallowance of Certain Interest Deductions Claimed by Banks

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ABSTRACT: The inability to estimate stockholder wealth effect magnitudes and hence disentangle them from changes in the stock market's assessment of the probability that a regulatory change will occur has hampered previous research in the economic consequences of accounting choices. This study measures cash flow effects independent of stock market behavior and thereby permits evidence of significant abnormal return behavior to be used to infer changes in the market's probability assessment of the imposition of a regulatory change. The study uses a seemingly unrelated regressions approach to investigate information events surrounding the issuance of IRS Revenue Procedure 80-55. Issued in late 1980, this rule stated that banks could no longer deduct interest paid on governmental time deposits collateralized by tax-exempt securities. Further, it was to be applied retroactively; and for firms in the sample used in this study, the average estimated tax liability caused by the retroactive provision was $24.2 million, or 5.6 percent of the market value of common stock. In addition to contributing to the economic consequences literature, this study also demonstrates the potential usefulness of capital market data in estimating the magnitude of probability revisions associated with IRS actions. Presumably such evidence is a relevant input in the social choice problem of whether an IRS action has imposed a "substantial impact" on affected parties.

REVENUE Procedure 80-55, issued in 1980, stated that banks would no longer be permitted to deduct interest on time deposits of governmental entities which were collateralized by tax-exempt securities. Banks in all but ten states are required to provide collateral for governmental time deposits (so-called "pledging" requirements). The collateral may be either federal securities (Treasury bills, etc.) or state and local obligations, but the latter were often chosen because interest earned on them was tax-exempt and state law often favors them over federal securities in pledging (see Ratti [1979]). Thus, many banks should have been affected adversely by this rule, particularly given that the Internal Revenue

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Service (IRS) stated its intention to apply it retroactively for a three-year period.[1] As discussed below, the mean tax effect of the retroactive provision on firms in our sample was an estimated $24.2 million, or 5.6 percent of the market value of common stock. The IRS, however, reversed its actions; first, it rescinded the retroactive provision, and subsequently, it cancelled the rule itself.

Several previous studies have assessed the economic consequences of accounting choices. Leftwich [1981] models the effects of mandated accounting changes on affected firms as the product of revision in the market's probability assessments that a change will be required and its cost on the affected firms. Holthausen and Leftwich [1983] note that researchers who have attempted to measure these effects have had difficulty in drawing strong conclusions for several reasons. First, specifying the dependent variable is a problem because of ambiguities in assessing factors related to the market's probability assessments, particularly identification of dates on which significant new information reached the market. Second, the power of tests used may be inadequate to detect unknown and possibly small wealth effects, if any, of accounting choices.

Our work is similar to these studies in that specification of event dates is somewhat difficult. The major contribution of this study stems from our ability to estimate relative cash flow effects of the retroactive part of the rule change on affected firms independent of stock market reaction. As such, we use evidence from the identification of significant abnormal return behavior to infer the nature of the consensus probability revisions associated with selected news items.

Additionally, our research demonstrates the potential usefulness of stock market data to measure the impact of tax regulation when affected parties are publicly traded firms. We review IRS administrative procedures and legal interpretations of the notion of a "substantial impact" (discussed below) of a tax rule, and we argue that stock price data may be used to estimate *ex post* part of the economic effect of a tax rule. Presumably, such evidence is a relevant input in a social choice problem of whether a "substantial impact" has occurred, as is the input of other affected parties.

The main results indicate a statistically significant negative market reaction linked with the announcement of the tax rule, and a significant positive market response at the time the retroactive provision of the rule was rescinded by the IRS. These results are consistent with the information events we document. Additional results suggest that an inability to estimate, and hence incorporate into the return-generating model, an independent measure of the cash flow effects caused by a regulatory change can lead to a failure to reject the null hypothesis of no effect. That is, even where the magnitude of the cash flow effects is material, if the revision of the probability of a rule change is small, methods for detecting excess returns which do not incorporate information about the magnitude effects may not be sensitive enough to detect significant abnormal market behavior.

Our paper is organized as follows. We first discuss the administrative processes in the IRS, the notion of "substantial impact," and the use of the event methodology. A chronology of information events follows. Methodological procedures, data, and results appear next, followed by a summary and some conclusions.

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[1] During the 1970s, approximately one-half of outstanding tax-exempt bonds were owned by banks. See Hempel and Patton [1976, Exhibit 10, p. 18], and Salomon Bros., Inc. [1982]. See also footnote 7.

ADMINISTRATIVE PROCEDURES, "SUBSTANTIAL IMPACT," AND STOCK MARKET BEHAVIOR

When authority to make a legislative change is delegated to a federal administrative agency, the Administrative Procedure Act (APA) of 1946 requires publication of "proposed rule making" in the *Federal Register* and an opportunity for "interested persons" to participate in the rule-making process by submitting data, views, and arguments, all of which must be considered before a rule is issued in final form [Bittker, 1981, pp. 110–126]. When a change is "interpretive" (made by an agency without exercising delegated legislative power to make law through rules), notice and comment procedure is not required by the APA but (as noted below) may be required by common law.

A crucial issue with so-called "interpretive" rules is how to determine whether an agency has exceeded its authority in issuing a rule, which it might do in two ways. First, it might attempt to exercise legislative authority it does not have; second, it might circumvent notice and comment procedure by issuing a legislative rule (whether or not power has been delegated) under the guise of an interpretive rule. Some courts have argued that if a rule has "substantial impact" it should be regarded as legislative and therefore subject to notice and comment procedure.[2] Davis [1979, p. 71] disagrees with this notion, but he does agree with a number of other courts that "substantial impact" may require notice and comment procedure "because of common law conceptions of fairness." In cases that follow this reasoning, the courts seem to imply that "substantial impact" means a material economic effect on a broad class of taxpayers.[3]

The IRS exercises delegated legislative authority through its Treasury Regulations. While not all Treasury Regulations are legislative, the IRS follows notice and comment procedure for all of them. It could be argued that any Treasury Regulation has the potential to have a "substantial impact" on a broad class of taxpayers whether it represents new law or an IRS interpretation of how a law passed by Congress should be enforced.

In addition to Treasury Regulations, the IRS also issues two lower levels of rules—Revenue Rulings and Revenue Procedures. Notice and comment procedure is not followed for either of these types of rules. Revenue Rulings are issued in response to an individual taxpayer request. The circumstances generally are sufficiently unusual to generate some uncertainty as to how the taxpayer will be affected by a particular provision of the Internal Revenue Code. Clearly, a Revenue Ruling may be quite important to the taxpayer to whom it is addressed and to taxpayers who find themselves in very similar circumstances. Revenue Procedures generally announce administrative practices followed by the IRS. For example, Revenue Procedure 79-45 [1979-2 C.B. 508] prescribes the facts, documents, and data required of a taxpayer who requests a ruling. Such statements may signal IRS attitudes, but they typically do not represent interpretations of the law.

In this paper we estimate the stockholder wealth effect of a controversial Revenue Procedure by examining the unexpected change in stock prices of a sample of affected firms at several times surrounding the issuance of the rule. The affected firms (banks) argued that the rule would have a material negative impact on them and on the ability of state and local governments to raise capital through tax-exempt bond issues. In effect, the banks argued that the Revenue Procedure would have a "substantial impact" on their operations. The IRS claimed that several earlier Revenue Procedures (see below) had "put banks on notice" [*Wall Street Journal,* December 31, 1980], i. e., that banks should have anticipated the new rule. Given that tax effects will be impounded in stock price, we provide evidence on the magnitude of probability revision from the IRS actions. Evidence that the rule came as a significant surprise to a large set of bank equity holders would suggest that at a minimum notice and comment procedure should have been followed by the IRS before the rule was finalized.

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[2] See, for example, *Chishom v. FCC* [538 F.2d 349 (D.C. Cir), cert. denied 429 U.S. 890 (1976)].

[3] For example, in *Pharmaceutical Manufacturers Ass'n v. Finch* [307 F. Supp. 858, 863-864 (D. Del. 1970)], the court referred to a "pervasive and substantial effect on the drug industry." Likewise, in *American Bancorporation, Inc. v. Board of Governors of the Federal Reserve System* [509 F.2d (8th Cir., 1974)], the court focused on the impact of a rule on the banking industry in order to determine if notice and comment procedure should have been followed.

To our knowledge, stock price data have not been used previously as evidence in determining the existence of a "substantial impact" of a tax rule. However, they have been used in court cases involving actively traded securities as a means of establishing and assessing damages under the Securities Acts.[4]

To assess the stockholder wealth effects of the tax rule, we employ the familiar event methodology popularized in the accounting and finance literature. Schwert [1981] has argued that security price data may be useful in measuring the actual effects of regulation. Using a multivariate regression approach, Schipper and Thompson [1983 and 1984] examined the impact of several merger-related regulatory changes and observed significant negative abnormal returns for the Williams Amendments to the securities laws. Binder [1983] was generally unable to find detectable regulatory effects using stock price data for 20 major regulations (none were tax rules).[5] IRS rules often have a measurable firm-specific cash flow effect and hence may produce detectable stock market effects, assuming event dates can be identified precisely.

The market behavior associated with a regulatory change announcement is an unbiased expectation of the present value of the cash flow effects resulting from the imposition of the regulation. This expectation in turn is the product of the magnitude of the cash flows (in present value terms) and the revision of the probability that a regulatory change will occur. Unless an event both is a complete surprise and eliminates all doubt that a rule will be imposed, the market reaction will be less than the total potential stockholder wealth effect of the rule. That is, if the prior probability of the event is nonzero, the market previously would have impounded an effect to the extent of its assessment of likely occurrence and magnitude. Even when the prior probability is zero, if at the time the rule is announced there is uncertainty regarding whether the rule actually will be implemented, the observed market reaction will reflect less than the total potential stockholder wealth effect. Hence, the ability to infer the market's probability revision is extremely important in interpreting stock market behavior. The direct link between tax changes and cash flow effects and the availability of an independent estimate of the magnitude of the wealth effects make an interpretation of the nature of the probability revisions possible in our study.

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[4] See *D. Feit v. Leasco Data Processing Equipment Corporation et al.* [332 F. Supp. 544 (E.D. N.Y. 1971)] and *D. Rolf v. Blyth, Eastman Dillon & Co., Inc. and M. Stott* [570 F.2d 38 (App. 2d Cir. 1978)]. Also see Leas [1974], Reder [1976], and Kripke [1976].

[5] Other studies employing a multivariate regression approach include Hughes and Ricks [1984] and Pownall [1984].

FIGURE 1

REVENUE PROCEDURES RELATED TO I.R.C. SECTION 265

Revenue Procedure No.:	70-20	72-18	78-34	80-55
Date of Issuance:	July 1970	Feb. 1972	Dec. 1978	Dec. 1980

Our empirical approach (described below) represents an extension of the method developed in Schipper and Thompson [1983]; see also Binder [1983] and Gibbons [1980]. We employ a seemingly unrelated regressions approach [Zellner, 1962] which controls for general stock market movements and bank interest rate sensitivity; the primary focus is on estimation of the coefficients of event variables weighted by firm-specific tax liabilities caused by the imposition of the tax rule under study. An estimate of firm-specific tax vulnerability was possible because the tax rule was retroactive, and this estimate provided a basis for inferring the extent of revision in the market assessment of the likelihood of the imposition of the rule. Additionally, a subsequent repeal of the retroactive provision allowed for investigating stock market behavior at the time of the reversal.

CHRONOLOGY OF EVENTS

Revenue Procedure 80-55

The general rule on interest deductibility indicates that taxpayers, other than banks, cannot deduct interest on funds borrowed to purchase tax-exempt securities [Internal Revenue Code (I.R.C.) section 265].[6] On December 15, 1980, the Internal Revenue Service issued Revenue Procedure 80-55, stating that commercial banks no longer would be permitted to deduct interest paid on negotiated time deposits of state and local governmental units when those deposits were secured by tax-exempt securities. Further, the rule was retroactive and was applicable to all such deductions made during the prior three years. The *Wall Street Journal* [December 22, 1980] referred to the rule as a "time bomb" that "promises to injure many financial institutions and perhaps plug a major source of capital for state and municipal governments."[7] By early January 1981, however, the retroactive provision had been dropped and implementation of the prospective part had been postponed for five months. The rule was subsequently cancelled prior to implementation.

Revenue Procedure 80-55 was the fourth in a series of related rules. These are shown in Figure 1 and discussed below.

Historical Antecedents: 1970's Debate

In 1970 the *Wall Street Journal* published several articles reporting on an IRS review of the deductibility by banks of interest on debt related to the purchase of tax-exempt securities. This review culminated in the issuance of Revenue Procedure 70-20. Under this rule, certain *short-term* debts (interbank deposits, notes, Eurodollar deposits, federal funds transactions, repurchase agreements, and direct borrowing from the Federal Reserve) were to be treated like deposits and not directly connected with the purchasing or carrying of tax-exempt debt. On the other hand, a direct connection was said to exist when certificates of deposit were issued to a state in exchange for tax-exempt obligations having approximately the same maturity date, and interest on these deposits would not be deductible.

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[6] Congress has made clear on several occasions that bank customer deposits were not to be treated as debt incurred to purchase or carry tax-exempt securities owned by banks on the ground that to do so would "seriously interfere with the marketing of governmental securities, which are bought for the most part by banks. . . ." [*S. Rept. 558*, 73d Cong., 24 (1934)]. However, see footnote 11.

[7] Referring to Revenue Procedure 80-55, Attermann [1983, p. 707] reports, "Figures of the Municipal Finance Officers Association disclosed that $30 billion of municipal bonds held by commercial banks were used to collateralize public deposits held by banks." This suggests an interesting extension to this study: investigate whether the rule change had an impact on municipal bond yields.

The IRS set forth further guidelines in Revenue Procedure 72-18. This rule stated that "direct evidence of a purpose to *carry* tax exempt obligations exists where tax exempt obligations are used as collateral for indebtedness" [1972-1 C.B. 740]. Banks were not specifically mentioned, but Revenue Procedure 72-18 would have to be regarded as "bad news" since banks routinely use tax-exempt securities as collateral for governmental deposits. The only remaining protection for banks from disallowance of the deductibility of interest on such deposits was the long-held government position that deposits were different from other debt for purposes of enforcing I.R.C. section 265.

The IRS did not raise the issue again until it released Revenue Procedure 78-34 in December 1978. Under this rule, I.R.C. section 265(2) would "not be applied to disallow deductions for interest paid by commercial banks on borrowing of Treasury tax and loan funds when these borrowings are secured by pledges of tax exempt obligations" [1978-2 C.B. 535]. The reasoning offered was that this type of borrowing "is in the nature of a demand deposit," and that "access to the funds is not subject to negotiated rates or any other market factors that normally influence arm's length money market transactions" [Rev. Proc. 78-34, 1978-2 C.B. 356]. While the same logic could not be used to exclude interest on time deposits of state and local governments secured by tax-exempt securities, the IRS at this time did not prohibit deduction of interest on such deposits.

1980-81 Events

The set of announcements most pertinent to the present study occurred late in 1980, in conjunction with the issuance of Revenue Procedure 80-55, which prohibited interest deductions on governmental time deposits collateralized by tax-exempt securities. In the following paragraphs we group these announcements into three event periods: the "bad news," the "initial good news," and the "subsequent events" periods.

Revenue Procedure 80-55 was first announced in the IRS *Weekly Bulletin* of Monday, December 15, 1980, and was also reported by the Bureau of National Affairs, Inc., in its *Daily Taxation and Accounting Report* (hereafter, BNA *Tax Report*) of that date. At that time the BNA *Tax Report* reflected the *previous* business day's news.[8] Further, private sector parties, such as commercial tax services, could obtain for a fee camera-ready copies of the IRS *Weekly Bulletin* on the Thursday preceding its official Monday publication date.[9] A search through several news sources did not locate any other reports about Revenue Procedure 80-55 or its possible issuance.[10] Hence, we conclude that news of Revenue Procedure 80-55 became publicly available over the three-day period: Thursday, December 11; Friday, December 12; and Monday, December 15. We refer to this as the "bad news" period.

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[8] Per a telephone conversation with a BNA *Tax Report* representative.

[9] This information was obtained through several telephone conversations with a representative of the IRS national office. Until some point in the late 1970s, which we are unable to determine precisely, camera-ready copy apparently was not available until the Friday before the official release date.

[10] For instance, the BNA *Tax Report* and the *Dow Jones News Service* were searched for news about Revenue Procedure 80-55 beginning December 1, 1980, and the *Wall Street Journal Index* was examined starting with the beginning of 1980.

The first *Wall Street Journal* report about the rule was on Monday, December 22. That report also indicated that the American Bankers Association (ABA) had organized opposition to the ruling and that its spokesman claimed, when interviewed the evening of December 19, that the ABA had already been informed by the IRS that the retroactive provision of the ruling would be withdrawn. The December 22 BNA *Tax Report* reported that the IRS shortly would meet with bankers to discuss (a) whether to withdraw Revenue Procedure 80-55 entirely, or if not, (b) whether to withdraw the retroactive provision. It appears, therefore, that information about a probable IRS reversal reached the market no later than Monday, December 22, and probably by Friday, December 19. Further, the *Wall Street Journal* article suggests that lobbying had been organized earlier in the week, raising the possibility that the stock prices might reflect the presumably increasing probability of a reversal prior to December 19.

Unfortunately, the December 19 BNA *Tax Report* reported that the IRS had (on December 18) postponed issuing an anticipated Revenue Ruling and as a consequence placed in doubt the enforcement of three previously issued rules that adversely affected bank holding companies. While these rules were unrelated to Revenue Procedure 80-55, the IRS action potentially had two effects on our sample firms. First, it was "good news" for banks and hence might confound tests of the reversal of Revenue Procedure 80-55 prior to December 19. Second, as argued by Amershi, Demski and Wolfson [1982], the apparently unrelated action quite possibly could signal a change in IRS regulatory philosophy toward banks in general. Hence there is some overlap in the time, effect, and arguably the meaning of the two "unrelated" IRS actions.

To some extent, however, our tests (detailed below) are able to parcel out the confounding event effects. For each event day a Revenue Procedure 80-55 intercept and a tax effect explanatory variable are "turned on" by the same event dummy variable. The event intercept picks up effects on banks occurring on the event day other than that associated with Revenue Procedure 80-55. As a consequence, the tax variable coefficient should not reflect a confounding effect caused by the "unrelated" IRS action *per se*, assuming that the effect of the confounding events is unrelated to the tax variable and that the relation between stock prices and the tax variable is a linear one. It might reflect, however, any signalling effect induced by the "unrelated" IRS action. In order to minimize the influence of the "unrelated" IRS action, and consistent with the reporting of news of the reversal that we have documented, we restrict the "initial good news" period to the two-trading day period, Friday, December 19 and Monday, December 22.

On December 31 the *Wall Street Journal* reported that the ABA had sent a legal memorandum to the IRS challenging the ruling. While the IRS claimed that its 1972 and 1978 Revenue Procedures had put banks on notice, the ABA argued that the new rule represented a substantial change in the law and should be withdrawn or delayed to let banks revise their bond holdings and to let states revamp their financing plans [*Wall Street Journal*, December 31, 1980]. The IRS officially announced on December 31, 1980, that the retroactive provision had been dropped and that it would not begin applying the new rule until January 10. The IRS also requested another memorandum from the ABA on "the substance of the thing" [*Wall Street Journal,* January 2, 1981]. Late on January 8, 1981, the IRS announced that the rule would not take effect until after May 31, 1981, and the January 30 BNA *Tax Report* noted the introduction of bills in both houses of Congress to nullify Revenue Procedure 80-55. During the next several months no further announcements were made, but the financial press speculated that the new Reagan administration might seek to reverse some of the IRS regulations issued in the last days of the Carter administration. Revenue Procedure 80-55 was singled out as "a likely candidate for reversal" [*Wall Street Journal,* March 6, 1981]. During this entire period weekly issues of *Tax Notes* reported that the Treasury Department had received dozens of letters in opposition to Revenue Procedure 80-55. In an article opposing the rule, Richardson and Weber [1981] noted that it represented a major departure from long-held administrative precedents and that such a change "should not be made by administrative fiat without the benefit of public hearing and comment." Finally, on April 6, 1981 [*Internal Revenue Bulletin* 1981-42] the IRS announced its withdrawal of the ruling but stated its intention "to study closely the extent to which banks should be treated differently from other taxpayers" [*Wall Street Journal,* April 9, 1981]. Our "subsequent events" periods begins after December 22. The events of all three periods are outlined in Figure 2.

To summarize, the IRS Revenue Procedures announced in 1970, 1972, and 1978 created a period of some uncertainty for banks in regard to deductibility of interest on governmental time deposits. Each of these rules left open the possibility that the deductibility of interest on deposits connected with the acquisition of tax-exempt securities would be severely restricted. This possibility was realized with the issuance of Revenue Procedure 80-55. Its reversal, however, strongly suggested that the IRS would not attempt to limit bank deductibility of interest on deposits collateralized by tax-exempt securities except through the route of new legislation.[11] In effect, the goal of protecting the market for tax exempts had dominated the IRS goal of treating banks the same as other taxpayers. The reversal was also consistent with the possibility that the IRS concluded that it had exceeded its delegated authority when it issued Revenue Procedure 80-55, or at least should have provided for a notice and comment period. It is also consistent with a changed regulatory environment of banks.

RESEARCH METHOD AND DATA

Sample Selection

We used the daily stock returns tape of New York and American Stock Exchange listed firms supplied by the University of Chicago's Center for Research on Security Prices (CRSP) to make up our sample. A total of 60 commercial banks[12] are included on the tape, but our sample consisted of fewer banks because (1) there were incomplete stock return data, or (2) other required data, noted below, were not available. Additionally, one firm was

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[11] The Treasury was successful in persuading Congress to add interest on debt to carry tax-exempt securities acquired after December 31, 1982, to the list of financial institution preferences in I.R.C. section 291(e). This provision effectively reduced the value of the deduction by 15 percent (20 percent after December 31, 1984). Further, the Treasury Department's November 1984 reform proposal suggested disallowing 100 percent of interest incurred by banks to carry tax-exempt securities.

[12] Commercial banks are assigned SIC codes 6022 or 6025. Additionally, some banks are included in SIC code 6711. Firms having SIC code 6711 were included in our sample if they were listed in Moody's *Bank and Finance Manual.*

FIGURE 2
EVENTS ASSOCIATED WITH REVENUE PROCEDURE 80-55

Calendar Date/Day	*Trading Day*	*Event*
Dec. 11 Thu.	1	Available to some private sector parties
12 Fri.	2	News per BNA *Tax Report*
15 Mon.	3	Official publication date
16 Tue.	4	
17 Wed.	5	
18 Thu.	6	Other event
19 Fri.	7	ABA interviewed
22 Mon.	8	*WSJ* & BNA *Tax Report* articles
*	*	
*	*	
*	*	
30 Tue.	13	ABA sent legal memo (*WSJ* article 12/31)
31 Wed.	14	Retro. cancelled; postponement (4:20 PM)
Jan. 2 Fri.	15	*WSJ* article
*	*	
*	*	
*	*	
8 Thu.	19	Second postponement (5:35 PM)
9 Fri.	20	*WSJ* article
*	*	
*	*	
*	*	
29 Thu.	34	House/Senate bills introduced
30 Fri.	35	BNA *Tax Report* article
*	*	
*	*	
*	*	
Mar. 6 Fri.	59	*WSJ* article: withdrawal likely
*	*	
*	*	
*	*	
Apr. 6 Mon.	80	Official withdrawal
*	*	
9 Thu.	83	*WSJ* article

Note: Times shown indicate time of day the news item appeared on the *Dow Jones News Service* (through Jan. 15 only). *WSJ* = *Wall Street Journal.*

eliminated because it announced during the test period that it would enter liquidation. The final sample consisted of 52 banks.

To gauge the effects of the tax events on shareholder wealth, we estimated the firm-specific tax liability caused by the retroactive provision of the rule. Data used to compute the liability estimates were obtained from firms' annual reports or Form 10K's, Moody's *Bank and Finance Manuals,* and the Federal Deposit Insurance Corporation's call reports.

Return-Generating Model

The Basic System. It is well known (e.g., Collins and Dent [1984]) that when all sample firms are (a) from the same industry and (b) affected simultaneously by the events of interest, as in our study, randomization across industries and over time is not possible. As a result, returns are likely to be cross-sectionally correlated and heteroscedastic, and industry-specific events, unrelated to the events of interest, may occur at the same time. These problems cannot be dealt with reliably using the traditional market model framework. Hence, we employed a seemingly unrelated regresssions (SUR) approach. Specifically, the following system of 52 equations was estimated over the 252 trading day period, July 1, 1980, through June 30, 1981:

$\gamma_b, \gamma_g \equiv$ estimated "bad news" and "initial good news" dummy event coefficients, respectively, cross-sectionally restricted;
$\gamma_b', \gamma_g' \equiv$ estimated "bad news" and "initial good news" tax variable event coefficients, respectively, cross-sectionally restricted;
$\tilde{\epsilon}_{it} \equiv$ estimated residuals;

$$\begin{aligned} \tilde{R}_{1t} &= \alpha_1 + \beta_1'\tilde{M}_{t-1} + \beta_i\tilde{M}_t + \beta_1''\tilde{M}_{t+1} + \delta_i\tilde{IN}_t + \gamma_b D_{bt} + \gamma_b' D_{bt}TV_1 + \gamma_g D_{gt} + \gamma_g' D_{gt}TV_1 + \tilde{\epsilon}_{1t}, \\ &\vdots \\ \tilde{R}_{nt} &= \alpha_n + \beta_n'\tilde{M}_{t-1} + \beta_n\tilde{M}_t + \beta_n''\tilde{M}_{t+1} + \delta_n\tilde{IN}_t + \gamma_b D_{bt} + \gamma_b' D_{bt}TV_n + \gamma_g D_{gt} + \gamma_g' D_{gt}TV_n + \tilde{\epsilon}_{nt}, \end{aligned} \tag{1}$$

where

$\tilde{R}_{it} = \dfrac{P_{it} + Div_{it}}{P_{it-1}} - 1 \equiv$ return on stock of firm i on day t;
$P_{it} \equiv$ closing price for firm i on day t;
$Div_{it} \equiv$ dividend for firm i on day t;
$\tilde{M}_t \equiv$ value-weighted market return on NYSE and ASE stocks on day t;
$\tilde{IN}_t \equiv$ unexpected changes in the effective federal funds rate of interest on day t;
$D_{bt} \equiv \begin{cases} 1 \text{ if day } t \text{ is a "bad news"} \\ \text{period day, 0 otherwise;} \end{cases}$
$D_{gt} \equiv \begin{cases} 1 \text{ if day } t \text{ is an "initial good} \\ \text{news" period day, 0} \\ \text{otherwise;} \end{cases}$
$TV_i =$ estimated tax liability from the retroactive provision of Revenue Procedure 80-55 for firm i;
$\alpha_i \equiv$ estimated intercept for firm i;
$\beta_i', \beta_i, \beta_i'' \equiv$ estimated betas for lagged, contemporaneous, and lead market returns, respectively, for firm i;
$\delta_i \equiv$ estimated interest sensitivity coefficient for firm i;
$n =$ number of sample firms $= 52$; and
$t = 1$ to 252.

Unlike the traditional market model approach [Fama, et al., 1969], the SUR method combines estimation and test periods into a single run, and the focus is on event parameter estimates rather than error terms. Additionally, abnormal returns and residual variances are allowed to differ across firms (equations), and the contemporaneous covariances in the residual variance-covariance matrix can be nonzero.

Control Variables. Controls were included for several factors. The first, for movement in the market as a whole, was supplemented by lead and lag variables to adjust for possible nonsynchronous trading [Scholes and Williams, 1977].[13]

A second control was for unexpected changes in interest rates. Returns on bank stocks, as a group and individually, may be more sensitive to interest rate movements than are returns of other industries [Chance and Lane, 1980; Flannery and James, 1984a and 1984b]. Interest sensitivity is potentially important for our study since much of the period under study, especially December 1980 and January 1981, was one of extreme interest rate volatility. Hence a variable capturing unexpected changes in interest rates was included, and its coefficient, which was allowed to vary across firms, is a firm-specific measure of interest rate sensitivity. Daily effective federal funds rates calculated by and obtained from the New York Federal Reserve Bank were used as the interest rate series. A third-order autoregressive [AR(3)] model in first differences was employed to yield an unbiased expectations model. Using this model, we could not reject the hypothesis that the prediction errors (i.e., residuals) were generated from a white noise process.[14] (An unanticipated interest rate series must have as a property a white noise process.)

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[13] The system also was estimated without the lead and lag variables and the results were essentially identical.

Event Parameter Estimates. The focus of our tests is on the estimates of the event parameters, which can take two forms. The first is the coefficient of a dummy variable that is assigned a value of one on the day of an event and represents an event intercept. The second is the coefficient of the event dummy variable that is augmented with the variable TV_i, the estimated firm-specific contingent tax liability caused by the retroactive provision of Revenue Procedure 80-55. In system (1), for the "bad news" and "initial good news" periods these are denoted $(\gamma_b D_{bt} + \gamma_b' D_{bt} TV_i)$ and $(\gamma_g D_{gt} + \gamma_g' D_{gt} TV_i)$ respectively.[15] Focusing on the "bad news" event, we note that both the event intercept and the tax effect variable are "turned-on" by the same dummy variable, D_{bt}. The tax effect variable coefficient γ_b', which is restricted to be the same for all firms, reflects the stock market effects related to Revenue Procedure 80-55 since the latter effects are *strictly proportional* to the tax effect variable, TV_i. On the other hand, the event intercept coefficient, which is also restricted cross-sectionally, reflects the *mean* effect of other factors affecting banks on the same day.[16] Because we are able to estimate a firm-specific tax effect, TV_i, any stockholder wealth effect of Revenue Procedure 80-55 should be captured in γ_b'. Since larger tax effects should translate directly into lower stock returns, the sign should be negative and a one-tailed test is appropriate. To the extent that

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[14] Virtually identical results were obtained when an ARIMA (3, 1, 2) model was employed. Only a short-term interest series has been used. Banks may be sensitive to longer-term interest rate movements as well, due to a mismatched exposure to interest rate risk on the asset and liability sides of the balance sheet. As a means of addressing this, we constructed an index of common stock returns of a large group of utilities. While largely uncorrelated with the short-term unexpected interest variable, it was highly correlated with the contemporaneous and lagged stock market indexes ($r = .54$ and $r = .29$, respectively). In our judgment, the likelihood of problems of multicollinearity outweighed the possible benefits of including the long-term interest movement factor. Further, Flannery and James [1984a] report similar results regardless of the interest measure used. Note also that interest factor lead and lag terms were excluded due to insufficient observations per parameter to be estimated. This may introduce a bias, however.

[15] This is analogous to the following cross-sectional regression:

$$CAR_{it} = \alpha + \gamma_t TV_i + \epsilon_{it}$$

where

$CAR_{it} \equiv$ cumulative abnormal returns for firm i over period t.

See Jain [1982] for a discussion of statistical problems of such cross-sectional regressions. While our method differs, our approach is in the spirit of Biddle and Lindahl [1982] who regress CARs onto an unexpected earnings variable and a tax savings variable resulting from a switch to LIFO.

[16] Lead and lag event dummy variables were not included because of power of test considerations. Note that including more than one day in an event period and forcing the event coefficient to be the same for all days within an event period is analogous to estimating the market effect on the average of the lead, contemporaneous, and lagged security returns.

measurement problems in estimating TV_i (discussed below) are not too severe, γ_b' may be interpreted as the change in the market's probability assessment (posterior-prior) that the tax rule would be imposed.[17] Absent a firm-specific variable, the entire focus would be on γ_b in $\gamma_b D_{bt}$. In our approach, however, γ_b should equal zero if no other events related to our sample firms occur contemporaneously, there is no measurement error in TV_i, and the relation between the tax variable and stock prices is linear. An explanation of the "initial good news" event coefficients parallels that of the "bad news" coefficients.

Asymptotically valid *t*-statistics are used in the event coefficient tests. While we assume a constant variance-covariance matrix, problems with estimation should be minimized by our use of prior information to estimate relative magnitudes of responses across firms and a large number of time series observations relative to the number of equations [Marais, 1984].

Within individual equations there is collinearity since D_{bt} is a variable for both γ_b and γ_b' (as D_{gt} is for both γ_g and γ_g'). Because the TV_i's differ, however, and because γ_b and γ_b', respectively, are constrained to be equal across all equations (as are γ_g and γ_g'), the entire system can be estimated simultaneously (i.e., a SUR approach) using a nonlinear solution technique. Specifically, the SYSNLIN procedure in the *SAS/Econometric and Time-Series Library* [1982] was employed.

Estimated Contingent Tax Liability. Revenue Procedure 80-55 had both retroactive and prospective effects. The prospective effects include the elimination of a tax arbitrage opportunity previously available and the costs associated with a stiffening in the regulatory environment. Hence, the total loss incurred by a firm was:

$$\text{Total Loss} = \text{Retroactive Effect} + \text{TAOL} + \text{REG},$$

where TAOL = tax arbitrage opportunity loss, and REG = opportunity costs of a changed regulatory environment. Since REG and TAOL in part would be functions of future opportunity sets and profitability (i.e., the more profitable a bank, the more likely it will make use of tax-exempt investments), they would differ across firms. We have no way of estimating firms' REGs and TAOLs; hence, we did not consider them directly in our tests. Their effects, if any, will be reflected in γ_b and γ_g.[18]

It was possible, however, to estimate the magnitude of the retroactive effect (i.e., the tax liability) of the 1980 rule on the banks included in our sample using publicly available data and to relate that estimate to the stock market reaction over (1) the "bad news" event period, (2) the "initial good news" period, and (3) the "subsequent events" period. Data from the Federal Deposit Insurance Corporation's *Report of Income and Report of Condition Subscription Service* (so-called FDIC call reports) were used since this was the most detailed source of bank financial statement data available to us. Unfortunately, information regarding interest expense on state and municipal deposits was not detailed, either for tax or financial reporting purposes. Hence, we derived an estimate of the interest deduction tax vulnerability indirectly by relating each bank's holdings of obligations of states and political subdivisions to its time deposits from those sources. Since U.S. Treasury securities and obligations of other U.S. government agencies and corporations generally could also be used to meet state collateral requirements, they affected the calculation of banks' interest deduction tax vulnerability,[19] as follows (firm-specific subscript suppressed):

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[17] If one assumes no measurement error, no anticipation of the rule (prior probability = 0), and no uncertainty about the rule's implementation (posterior probability = 1), then γ_b' should equal -1. Probability revision is discussed above, and measurement error in TV_i is addressed below.

[18] Following Miller [1977], it can be argued that $TAOL = 0$. That is, if r_M = return on a tax-exempt bond, r = return on a taxable bond, and t_c = corporate income tax rate, then after-tax income for a bank is r_M, if the tax-exempt bond is held, or $(1-t_c)r$, if the taxable bond is held. In equilibrium, however, $r_M = (1-t_c)r$. Hence, a bank would be indifferent between the two kinds of bonds. See also Skelton [1983] and Koch [1982]. However, while a bank might find itself indifferent once the exogenous shock of a tax rule change occurs, it may nevertheless suffer a loss in equity value equal to the discounted expected future tax benefits under the old system.

$$TVD = Max\{0, [SLD - Max(0, FS - FD)]\}, \qquad (2)$$

where

$TVD \equiv$ tax vulnerable deposits;
$SLD \equiv$ state and local government time deposits;[20]
$FS \equiv$ federal securities; and,
$FD \equiv$ federal deposits.

Year-end balances were used. All sample firms had December 31 year-ends.

When there was an excess of federal securities over federal demand, time, and savings deposits, but the excess was less than *SLD*, *TVD* was equal to $SLD - (FS - FD)$. Some banks had no tax vulnerability (i.e., $TV = 0$) since they had investments in federal securities in sufficient amounts to collateralize both federal and state and local deposits.[21] In cases where holdings of federal securities fell short of meeting federal deposit requirements, state and municipal securities were assumed to make up the federal collateral deficiency[22] as well as to collateralize state and local deposits.

FDIC call report data were available for the years 1978, 1979, and 1980. We calculated *TVD* as of each year-end and then, for 1979 and 1980, used current and previous year-end *TVD* balances to determine an average for the year, $\overline{TVD}$. For 1978 only, we used the year-end balance. We then multiplied $\overline{TVD}$ by (1) the average interest rate (r) paid by bank i in year j on state and local deposits and by (2) the bank's marginal income tax rate (mt) for year j. That is:

$$TL_j = (TVD_j)(r_j)(mt_j), \qquad (3)$$

where

$TL_j \equiv$ contingent tax liability for year j.

In general, the marginal tax rate was the federal statutory rate in each year: 48 percent for 1978, and 46 percent for 1979 and 1980. In cases where firms had operating loss carryforwards, the appropriate marginal tax rate is not obvious. If it is likely that a firm eventually will make use of the carryforwards, their use to offset the provisions of Revenue Procedure 80-55 means they cannot be applied against future taxable income. Hence, the relevant tax rate is the future statutory rate discounted back to the present at the appropriate cost of capital. On the other hand, the marginal rate should be zero if the carryforwards otherwise will expire unused.[23]

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[19] F.D.I.C. deposit insurance of $100,000 on federal, state, and local deposits also serves a collateralization function. However, we did not have data on the number of different government subdivisions having deposits in particular banks.

[20] In addition to time deposits, there are pledging requirements for state and local demand deposits. These were excluded, however, because banks did not pay interest on them and hence they did not give rise to any interest deductions.

[21] It might be argued that for tax vulnerability as opposed to pledging purposes, banks might first apply federal securities to collateralize state and local deposits, thus reducing the amount of time deposits on which interest had been deducted that were secured with tax-exempt securities. However, Revenue Procedure 80-55 clearly would disallow interest deductions on deposits where there was a link between the timing of the deposit and the purchase of tax-exempt securities. Given both the prevalence of state and local pledging requirements that favor the use of state and local securities [Ratti, 1979] and the negotiated nature of the deposits, banks would be hard pressed to argue the absence of a state or local time deposit/tax exempt security link such that federal securities arbitrarily could be substituted for tax exempts. Hence, we believe our approach to estimating firms' tax vulnerabilities is consistent with Revenue Procedure 80-55.

[22] Generally, only 80 percent of the book value of available state and local securities is counted as collateral for federal deposits. Note that state laws differ regarding the use of face or market value of securities for pledging purposes. Only book value data were available, however.

Only three of our sample firms had both negative current federal tax liabilities and net operating loss carryforwards in years when they also had a nonzero $\overline{TVD}$. Because their carryforwards were growing over the 1978–1980 period, recovery of the net operating losses seemed improbable in the near future and we assigned them a marginal tax rate of zero.[24]

Interest rate disclosures were far from uniform, with smaller banks providing the least detail. Ideally, we wanted the average interest rate paid on negotiated time deposits of state and local governments; however, only two banks provided this rate. For consistency within the sample, we used interest paid on other time deposits since typically it was reported.[25]

The final steps in the calculation of TV may be summarized as follows:

$$TTL = \sum_{j=1}^{3} TLj, \text{ and} \tag{4}$$

$$TV = TTL/TMV, \tag{5}$$

where

$TTL \equiv$ total contingent tax liability,
$TMV \equiv$ total market value of shares outstanding, and
$TV \equiv$ standardized tax vulnerability.

Summing up the TLj from equation (3), we obtained the resulting TTL, which in turn was standardized by the total market values of shares outstanding[26] as of December 8, 1980,[27] to yield TV (i.e., TV_i), which is the independent variable used in system (1). This standardization allowed for comparison of the relative magnitudes of the estimated tax liability across firms and enabled us to interpret the tax variable coefficients (γ_k' and γ_g') as revisions in the market's probability of the imposition of the tax rule change.

The tax liability data appear in Table 1. For the entire sample, the mean TTL was \$22.4 million, ranging from zero to \$178.0 million. For TV, the average was .0519, or 5.19 percent of market value, with a low of zero and a high of 27.23 percent. For banks in states having pledging requirements (48 of the 52 sample firms), the corresponding average magnitudes were \$24.2 million and 5.62 percent, respectively. These data suggest nontrivial tax effects of a magnitude detectable using stock price data [Brown and Warner, 1984].

Because TV is an estimate of the tax effect of the retroactive disallowance of interest deductions claimed, it is subject to

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[23] Loss carryforward data were obtained from *Disclosure, Inc.* microfiche records of firms' annual reports or Form 10Ks. Note that firms having large tax carryover benefits presumably are potential takeover candidates. However, expiration of tax benefits associated with net operating loss carryforwards is more likely for banks than for other corporations. The permitted pattern of use for banks is a ten-year carryback and a five-year carryforward rather than the three-year carryback, 15-year carryforward permitted most corporations (effective since 1975; IRC section 172(b)(1)(F)).

[24] Only four firm-years (out of 156) were affected. System (1) was reestimated using a 30 percent tax rate for these four cases. The results were qualitatively unchanged.

[25] Per firm's annual reports, Form 10Ks or Moody's *Bank and Finance Manuals*. Also, interest on time deposits in excess of \$100,000 was used in place of interest on other time deposits when the latter was not disclosed.

[26] S&P *Daily Stock Price Record-NYSE*, 4th quarter 1980; or, Moody's *Bank and Finance Manuals* and the *Wall Street Journal*.

[27] December 8, 1980, was used because (1) it predated the initial Revenue Procedure 80-55 events such that none of the tax effects (if any) should have been impounded in stock prices, yet (2) was quite close to the time of the events.

TABLE 1
LIST OF SAMPLE FIRMS

No.	*Name*	*State*	*TTL (000)*	*TV*
1	Bancal Tri-State	CA	$ 31,990	0.2723
2	Bank of New York	NY	34,240	0.1597
3	Bank of Virginia	VA	10,582	0.1664
4	BankAmerica	CA	178,018	0.0482
5	Bankers Trust NY	NY	7,384	0.0108
6	Barnett Banks of Florida	FL	0	0.0000
7	Chase Manhattan	NY	37,716	0.0268
8	Chemical NY	NY	364	0.0006
9	Citicorp	NY	23,722	0.0090
10	Citizens 1st National Bank	NJ	0	0.0000
11	Continental IL	IL	50,621	0.0462
12	Crocker National	CA	63,301	0.1316
13	Depositors	ME*	0	0.0000
14	Equimark	PA	0	0.0000
15	Fidelity Union	NJ	4,375	0.0409
16	Financial Gen'l Bnkshrs.	VA	0	0.0000
17	First Chicago	IL	15,125	0.0280
18	First City Bncp.	TX	40,503	0.0579
19	First Interstate Bncp.	CA	177,246	0.1624
20	First National Boston	MA	0	0.0000
21	First National State Bncp.	NJ	13,385	0.1611
22	First PA	PA	0	0.0000
23	First VA Banks	VA	0	0.0000
24	First Wisconsin	WI*	0	0.0000
25	General Bnkshrs.	MO	0	0.0000
26	Harris Bnkcp.	IL	621	0.0039
27	Industrial National	RI	8,588	0.0750
28	Interfirst	TX	14,922	0.0169
29	Irving Bank	NY	3,339	0.0094
30	Litco Bncp. NY	NY	0	0.0000
31	Manufacturers Hanover	NY	20,859	0.0212
32	Marine Midland Banks	NY	43,622	0.1724
33	Mercantile Texas	TX	24,029	0.1212
34	Money Management	IN*	0	0.0000
35	Morgan, J. P.	NY	0	0.0000
36	NCNB	NC	17,854	0.0774
37	NBD Bncp.	MI	45,225	0.1475
38	Northeast Bnkshr.	ME*	0	0.0000
39	Northwest Bncp.	MN	0	0.0000
40	Republic New York	NY	1,528	0.0048
41	Republic Texas	TX	24,019	0.0451
42	Seafirst	WA	78,151	0.2206
43	Security Pacific	CA	44,236	0.0558
44	Southeast Banking	FL	0	0.0000
45	Southwest Bncshrs.	TX	14,074	0.0638
46	Southwest Florida Banks	FL	0	0.0000
47	Texas Commerce Bnkshrs.	TX	40,667	0.0491
48	Union Commerce	OH	0	0.0000
49	United Jersey Banks	NJ	3,333	0.0607
50	Wachovia	NC	19,269	0.0860
51	Wells Fargo	CA	68,850	0.1204
52	Wyoming Bnkcp.	WY	1,379	0.0245

TABLE 1—*(Continued)*

No.	*Name*	*State*	*TTL (000)*	*TV*
Overall:				
Mean			$22,368	0.0519
Standard Deviation			37,386	0.0676
Banks in states with pledging requirements:				
Mean ($n=48$)			$24,232	0.0562
Standard Deviation			38,347	0.0687

Notes: TTL = Total tax liability, in thousands of dollars.
TV = TTL divided by total market value, 12/8/80.
State = Primary state if bank is in more than one.
* State having no pledging requirement for public deposits. All other banks were in states having 100% pledging requirements with the exception of Virginia which required 50% collateralization. (Sources: American Bankers Association [1976] and Conference of State Bank Supervisors [1979].)

measurement error. Several sources of potential measurement error exist. First, as noted above, interest rate disclosures were not uniform and rarely did firms disclose the rate paid on state and local government negotiated time deposits.

Second, firms' holdings of government securities and deposits as of December 31, 1980, were not publicly known to market participants until near the end of the first quarter of 1981. Yet we include these in the *TV* calculation as of the December 1980–January 1981 event days. Hence, we are assuming the availability of substitute sources of information to market participants.

Third, as previously discussed, the choice of the appropriate marginal tax rate was problematic for a small subset of firms due to uncertainty regarding the eventual use of tax benefit carryforwards where these were growing over time. We assumed some would expire unused. (However, see footnote 24.)

Fourth, as noted in footnote 19, we did not have data on the number of deposit accounts of federal, state, and local governmental subdivisions in each of our sample banks. We assumed the same numbers for all banks. Since FDIC deposit insurance on such deposits serves a collateralization function, any differences in the number of such deposits among our sample firms will affect the calculation of *TV*.

Finally, as suggested in footnote 21, there may have been some uncertainty regarding the extent to which the IRS ultimately would have allowed banks to use federal (i.e., taxable government) securities to collaterize state and local deposits, and hence reduce their tax liabilities under Revenue Procedure 80-55. Our approach was the least favorable for the banks. In a similar vein, the IRS probably would have assessed interest penalties on the individual year tax liabilities (TL_j); however, we ignored interest assessments.[28]

The effect of these measurement problems may be a case of errors-in-variables. If the other independent variables are measured without error, then the *TV* coefficient may be biased toward zero depending on the correlations between the independent variables. However, since the market return and unexpected change in interest rate variables likely reflect measurement error as well, the direction of bias, if any, in γ_b' and γ_g' is unclear [Maddala, 1977].[29]

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[28] Yearly interest rates in effect on the due dates of the 1978–80 tax returns were, respectively, six percent, 12 percent, and 12 percent compounded annually. As of December 1980–January 1981, no interest would have accrued for 1980. Ignoring potential interest penalties understates the TL_j for 1978 and 1979.

RESULTS

Results of the stock returns tests are reported in this section. After examining some diagnostics, we discuss test results of the "bad news" period, the "initial good news" period, and the "subsequent events" period. A comparison of the results with those that would be obtained had methods used in other studies been employed concludes the section.

In Table 2 we present firm-specific parameter estimates for the intercept and the control variable coefficients. The lead, contemporaneous, and lagged market return coefficients yield an estimate of each firm's market beta. Virtually all of the estimated betas are below 1.00, with the mean being 0.57. These statistics are typical of commercial banks; for example, Flannery and James [1984a] report portfolio betas of approximately 0.56 using weekly returns. Regarding the interest sensitivity coefficients, δ_i, ten of the 52 are statistically significant at the ten percent level (two-tailed) or beyond. Further, 38 (73 percent) of the 52 coefficients are positive, which rejects the null of an equal proportion of positive and negative interest sensitivity coefficients at the 0.1 percent level (two-tailed, normal approximation of the binomial). This result is consistent with Flannery and James [1984a].[30] Note that the statistical tests (i.e., diagnostics) of the δ_i should be viewed only as suggestive since the assumption of independent observations may not hold.

Results for the "bad news" period are presented in Table 3. As noted above, the focus is on the TV_t coefficient, γ_b'. For the three-day period, a negative and statistically significant effect is detected. Virtually all of the effect occurred on the two days[31] prior to the official publication date of the rule. Note that the mean daily abnormal return for the "bad news" period was $-.002$ (or -0.2 percent).[32]

The "initial good news" period results are shown in Table 4. For the two-day period, a significant positive effect is observed for γ_g', with most of the effect occurring on December 19.[33] The mean daily abnormal return was .008 (or 0.8 percent). Also, as expected, the sign of γ_g' is opposite that of γ_b'. As a descriptive statistic, we employed an asymptotic χ^2 test suggested by Gallant and Jorgenson [1979] and could not reject the hypothesis that $\gamma_g' = -\gamma_b'$.

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[29] Correlations among the control independent variables were ($t = 252$; significance levels shown in parentheses):

	$\tilde{M}_t$	M_{t+1}	$I\tilde{N}_t$
$\tilde{M}_{t-1}$	.141 (.03)	$-.017$ (.78)	$-.115$ (.07)
$\tilde{M}_t$	1.000	.148 (.02)	$-.103$ (.10)
$\tilde{M}_{t+1}$		1.000	$-.066$ (.30)

With one exception, pairwise correlations between the control and event independent variables (52 equations) were not significantly different from zero. The correlations between the interest rate variable and the event parameters ranged from zero to .168.

[30] Positive coefficients indicate an inverse relation between unexpected interest rate changes and banks' stock returns.

[31] Individual day results in Tables 3 and 4 were run separately, due to computer space limitations. While this introduces a misspecification bias, it does not appear to be a severe problem since the individual day results are consistent with the overall period results.

[32] Mean daily abnormal returns for the "bad news" and "initial good news" periods were computed from the coefficients of event dummy variables incorporated in a special case of SUR in which the independent variables are identical and do not include the TV_t variable. See the discussion of Table 5.

[33] Tests of the "bad news" and "initial good news" periods were rerun after dropping the four banks located in states having no pledging requirements for public deposits. The results were quite similar to those reported in Tables 3 and 4.

TABLE 2
FIRM-SPECIFIC PARAMETER ESTIMATES OF CONTROL VARIABLES FOR SYSTEM (1)

Equation No.	α_i	β_i'	β_i	β_i''	δ_i
1	−.0003	.162	.631*	.196	.0003
2	−.0001	.053	.397*	.025	.0003
3	.0002	.152	.426*	−.136	.0004
4	−.0019*	.047	.875*	.063	.0008*
5	.0002	.322*	.600*	.007	.0003
6	.0016	.279*	.439*	−.116	.0002
7	−.0004	.120	.677*	−.005	.0005
8	.0006	.021	.526*	.155*	.0004
9	−.0003	.045	1.040*	−.015	.0004
10	.0006	.115*	−.094	.002	−.0003
11	.0003	.158	.468*	−.039	.0005
12	.0003	.065	.357*	.080	.0003
13	.0021*	.001	−.034	−.035	−.0002
14	.0012	.157	.257*	−.101	−.0002
15	−.0006	.191*	.063	−.127	.0002
16	.0027	−.256	.241	.296	−.0000
17	.0002	.059	.773*	.085	.0003
18	.0010	.283*	.364*	−.097	.0005
19	−.0001	.220*	.319*	.108	.0008*
20	.0015	.037	.510*	.051	−.0001
21	.0009	.340*	.428*	−.020	−.0002
22	−.0004	.057	.956*	−.160	−.0002
23	.0016	.221	.381*	−.161	−.0002
24	.0012	.138	.052	−.008	.0004
25	.0019*	.008	.199*	−.085	−.0006*
26	.0009	.286*	.256*	.003	.0003
27	.0013	.266*	.460*	−.076	−.0001
28	−.0000	.264*	.337*	−.071	.0007*
29	.0004	.178*	.319*	.015	.0004
30	.0043*	.240	.133	−.130	−.0007
31	.0001	.051	.504*	.114	.0002
32	.0009	.380*	.792*	−.007	−.0001
33	.0025*	.221*	.130*	−.132	.0001
34	.0004	−.015	.096	.005	.0003
35	−.0001	.052	.500*	−.041	.0005*
36	−.0005	.182	.508*	.045	.0004
37	.0006	.454*	.277*	−.065	−.0002
38	.0011	.279*	−.012	.094	.0002
39	−.0006	.169*	.370*	.179*	.0008*
40	.0044*	.210	.523*	.236	−.0009
41	.0002	.327*	.423*	.041	.0007*
42	−.0008	.261*	.380*	.287*	.0007*
43	.0001	.083	.363*	.082	.0007*
44	.0006	.307*	.377*	−.001	.0003
45	.0013	.081	.240*	−.082	.0001
46	.0025*	.379*	.390*	.053	.0002
47	.0009	.283*	.486*	−.031	.0002
48	.0003	−.118	.449*	.061	.0000
49	.0004	.025	.240*	.053	.0005
50	.0013	.196	.295*	−.038	.0001
51	−.0008	.165	.649*	−.033	.0008*
52	.0018	.171	.291*	.209*	.0001

TABLE 2—*(Continued)*

Equation No.	α_i	β_i'	β_i	β_i''	δ_i
Overall:					
Mean	.0007	.161	.397	.014	.0002
Standard Deviation	.0012	.132	.235	.109	.0004

Notes: Equation No. corresponds to the number in Table 1.

$\alpha_i \equiv$ estimated intercept for firm i.

$\beta_i', \beta_i, \beta_i'' \equiv$ estimated betas for lagged, contemporaneous, and lead market returns, respectively, for firm i.

$\delta_i \equiv$ estimated interest sensitivity coefficient for firm i.

* Significant at 10% level or beyond (two-tailed t-test of difference from zero).

TABLE 3

RESULTS OF "BAD NEWS" PERIOD TESTS

$(\gamma_b D_{bt} + \gamma_b' D_{bt} TV_i)$

	γ_b	γ_b'
(a). Entire 3-Day Period:		
estimate	−.0006	−.0354
t	−0.28	−2.09
approx. p-value	.78	.02
(b). Individual Days:		
Dec. 11		
estimate	−.0057	−.0546
t	−1.69	−1.88
approx. p-value	.09	.03
Dec. 12		
estimate	.0024	−.0355
t	0.69	−1.22
approx. p-value	.49	.11
Dec. 15		
estimate	.0018	−.0187
t	0.53	−0.64
approx. p-value	.59	.26

Note: p-values are two-tailed for γ_b and one-tailed for γ_b'.

The several "subsequent events" through January 30 (see Figure 2) were also examined. We observed no significant effects with the exception of a significant positive reaction on January 9 associated with the five-month postponement of the effective date of the procedure.[34,35]

The results reported in Tables 3 and 4 indicate values insignificantly different from zero for the event intercepts (γ_b and

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[34] Note that no control was included for the January effect [Keim, 1983], which might lead to a model misspecification problem. However, this would not seem to be a severe problem in our study. Our sample is composed primarily of large banks, whereas the January effect suggests that small firms outperform the market, with most of the effect occurring in the first five trading days.

[35] Stock market behavior associated with the 1970, 1972, and 1978 rules (see Figure 1) was examined using system (1), with the following modifications. First, return data for some firms were not available, resulting in the following sample sizes: 1970, $n=18$; 1972, $n=27$;

TABLE 4
RESULTS OF "INITIAL GOOD NEWS" PERIOD TESTS
$(\gamma_g D_{gt} + \gamma_g' D_{gt} TV_i)$

	γ_g	γ_g'
(a). Entire 2-Day Period:		
estimate	.0029	.0442
t	1.20	2.13
approx p-value	.23	.015
(b). Individual Days:		
Dec. 19		
estimate	.0022	.0591
t	0.64	2.04
approx. p-value	.52	.02
Dec. 22		
estimate	.0032	.0233
t	0.94	0.80
approx. p-value	.35	.21

Note: p-values are two-tailed for γ_g and one-tailed for γ_g'.

γ_g), providing evidence that no factors (other than those controlled for) affected the sample of banks contemporaneously with the Revenue Procedure 80-55 events. In light of this result, we reestimated system (1) without the event intercepts. The results: $\gamma_b' = -.0373$ ($t = -2.37$, p-value $= .01$); $\gamma_g' = .0628$ ($t = 3.25$, p-value $= .001$).[36] These increased significance levels are consistent with measurement error in the TV_i and/or with collinearity between the event intercept and tax variables serving to distribute the market reaction between the γ_g and γ_g' (and the γ_b and γ_b') coefficients in the model as originally specified.

Note that the magnitudes of γ_b' and γ_g' are -3.5 percent and 4.4 percent, respectively (-3.7 percent and 6.3 percent without the event intercepts). A possible explanation for the low levels of the coefficient estimates is that the revocation of the retroactive provision coupled with the postponement of the "unrelated" bank holding company tax ruling signalled a change in the regulatory philosophy of the IRS toward banks. Such a change could have resulted from Congress's passing major bank deregulation legislation earlier in 1980, or perhaps from the impending change in administrations in Washington [Amershi, et al., 1982].

It is instructive to compare our results with those that would be obtained had the approach used in other studies been used.

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and, 1978, $n = 46$. Second, the TV_i were set equal to zero for banks located in states that had no pledging requirements in the early 1970's. Note that the use of TV_i's in examining the wealth effect of these earlier rules was based on the assumption that TV_i (the estimate of the retroactive provision of the 1980 rule) was highly correlated with the effects (all prospective) of each of the earlier rules. To test the sensitivity of the results to this assumption, the events were also examined using only a 0,1 event dummy variable (with the restriction that all firms have identical event parameters and using the full covariance matrix). The results indicate no abnormal market behavior for the 1972 and 1978 rules. Associated with the initial *Wall Street Journal* article reporting that the IRS was considering issuing (what would later be) Revenue Procedure 70-20, and in which likely provisions were detailed, there was a statistically significant negative effect, as reflected by the coefficient on the event dummy variable, but an insignificant negative effect on the TV_i variable. The effect was significantly negative when the event dummy was run alone.

[36] The hypothesis that $\gamma_g' = -\gamma_b'$ could not be rejected.

TABLE 5

RESULTS OF HYPOTHESES TESTS USING ONLY AN EVENT INTERCEPT

	"Bad News"	"Initial Good News"
Mean Daily Abnormal Return	−.002	.008
(1). The Sum of Event Parameters is zero:		
F-value*	0.48	4.90
p-value (DF: 1 and 245)	.49	.03
(2). All Firms Have Event Parameters Equal to zero:		
F-value*	0.88	2.70
p-value (DF: 52 and 194)	.71	.0001
(3). All Firms Have Identical Event Parameters:		
F-value—full**	1.10	3.42
approx. p-value	.29	.0001
F-value—diagonal**	0.77	2.34
approx. p-value	.88	.0001

Note: One-tail tests

* Exact F-statistics assuming normally distributed and serially independent residuals and a consistent estimate of the covariance matrix. Hypothesis (1): special case of Theil's [1971] F-statistic. Hypothesis (2): Rao's [1973] F-statistic.

** Asymptotic F-statistics corresponding to two alternative specifications of the covariance matrix of residuals: the full and diagonal (own variance) matrices, respectively. (DF: 51 and 245.)

Therefore, we deleted the tax variable and reran system (1) with only event intercepts (i.e., $\gamma_b D_{bt}$ and $\gamma_g D_{gt}$ as well as the control variables). This specification is a special case of the SUR method in which the independent variables are identical for all equations. We tested three hypotheses: (1) the sum of event parameters is zero, which is analogous to a test of mean abnormal returns; and two joint tests, (2) all firms have event parameters equal to zero; and (3) all firms have identical event parameters. We used the SAS [1982] REG and SYSREG procedures to compute F-statistics (see Schipper and Thompson [1983 and 1984], Binder [1983], Hughes and Ricks [1984], and Marais [1984]). The results appear in Table 5.[37] For all three hypotheses, the results suggest the absence of an effect in the "bad news" period and the presence of a highly significant positive "initial good news" period reaction. The "bad news" event result is not consistent with that reported in Table 3 for γ_b'. It appears, therefore, that the enhancement in statistical power resulting from the use of the firm-specific tax effect variable makes a critical difference. When the level of abnormal returns associated with an event is not highly significant, incorporating prior information about the relative magnitude of the cash flow effects enables a researcher to focus on the probability revision component of an observed market reaction, and accordingly to increase the power of the tests.

SUMMARY AND CONCLUSIONS

We have provided evidence of a negative and significant stock market reaction to the issuance of IRS Revenue Procedure 80-55—evidence confirmed by the effect observed at the time the IRS rescinded the retroactive provision of the rule. Our empirical procedures enabled us to infer the extent of probability revisions stemming from the IRS actions. Specifically, the results suggest that market agents were surprised by the issuance of the rule in spite of the IRS contention that banks had been "put on notice" by earlier Revenue Procedures. Presumably, this evidence is a relevant input into the social choice decision of whether a "substantial impact" occurred and thus whether notice and comment procedures should have been followed by the IRS.

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[37] Fewer degrees of freedom remain in the data than are used to calculate significance levels in the reestimated system without intercepts.

The results are based on a stock market event study in which we employed a seemingly unrelated regressions approach and included a firm-specific tax liability variable, estimated using publicly available bank data. Since (potential) tax liabilities represent direct cash flows, we could infer the nature of consensus probability revisions associated with news items in light of the identification of significant abnormal return behavior. This is in contrast to most economic consequences studies of changes of financial accounting methods, in which there is no direct link between changes in accounting method and changes in cash flows (the IRS LIFO conformity rule is an exception). As in these studies, however, there was a need to determine the timing of the relevant events. We examined several news sources in this regard.

While the current scarcity of theory makes the prediction of magnitude effects problematical in accounting change studies, the results reported here may be useful as a means of gauging the magnitude necessary to be detectable using actual stock returns series. Where magnitudes can be estimated *a priori*, the method employed here can yield results useful in evaluating stockholder wealth effects of a regulation or can be a test of the effectiveness of tax rule changes in light of goals intended by Congress or the IRS.

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Toward a Positive Theory of Information Evaluation: Relevant Tests of Competing Models in a Principal-Agency Setting

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ABSTRACT: This paper reports the results of an experiment to test four models of the principal's information evaluation behavior in a private, pre-decision, principal-agency setting. The four models tested were an expected utility model, a prospect theory model, a linear model and a multiplicative model. In response to recent criticism that tests of positive theories in accounting lack sufficient power to discriminate among competing theories, the tests of the models were designed to disconfirm the models' predictions without assuming initial conditions. The model which best resisted the attempts to falsify it was the multiplicative model. The results demonstrate the generalizability of theories of information evaluation behavior from an information evaluator-decision maker setting to a principal-agency setting and show that the descriptive validity of principal-agency theory can be enhanced by incorporating models of individual behavior other than those based on expected utility theory. The study also provides a rigorous test of prospect theory and offers guidance for the future development of this theory.

The accountant can be viewed as an information evaluator (*IE*) who chooses among alternative information systems whose signals will be used by a decision maker (*DM*) in selecting actions. Two streams of research—one normative and the other descriptive—have attempted to model the accountant's information evaluation behavior within an *IE-DM* framework. Examples of the normative research include Feltham and Demski [1970], Demski [1980], Feltham [1973] and Demski and Feltham [1976]. The second stream has sought to test the descriptive validity of the normative models. In cases where these models have been found not to be descriptively valid, this research has sought to provide an empirical basis for their modification and/or the development of alternative models [Uecker, 1978, 1980; Hilton, Swieringa and Hoskin, 1981; Hilton and

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Swieringa, 1981; Schepanski and Uecker, 1983].

The *IE-DM* framework recently has come under criticism for not adequately reflecting the relationship between accountants and decision makers within a firm. For example, Kaplan [1982, p. 13] argues that within the *IE-DM* framework, the *DM* plays no useful role other than to be a foil for the *IE*. The optimal solution in this setting is to permit the *IE* to choose both the information system and the action alternative with the *DM* left only to implement the chosen course of action. Thus, theories explaining *IE* behavior in an *IE-DM* setting may be of limited interest to accountants because the theories may not be generalizable to settings which more adequately reflect the relationship between accountants and decision makers. Further, the descriptive validity of these theories is suspect when the *DM*, whose behavior is specified exogenously in the *IE-DM* framework, is assumed to act in a suboptimal manner [Baiman, 1982, p. 160]. Consequently, research is needed to determine if descriptive theories of *IE* behavior in an *IE-DM* setting are valid in settings which more adequately reflect the relationship between accountants and decision makers within a firm.

Because of the inadequacy of the *IE-DM* framework as a descriptive model, model-based research in managerial accounting has begun to address information issues within a Principal-Agency (*P-A*) framework. In a *P-A* framework, the firm is characterized as an overlapping set of contracts between self-interested individuals. The behavior of the agent is derived endogenously within the *P-A* framework and the behavior of both the principal and the agent are represented by the expected utility hypothesis. The *P-A* framework has been hailed as a potential basis for a comprehensive theory of managerial accounting [Mattessich, 1980, pp. 226–230]. In their recent survey, Demski and Kreps [1982] observed that the *P-A* framework is rapidly attaining a position of dominance in model-based research in managerial accounting but that empirical tests of the models within this framework are needed.

The present study reports the results of an experiment designed to test competing models of the principal's information evaluation behavior in a *P-A* setting. Subjects were placed in the role of a principal who must assess the value of information to be provided to an agent. The *P-A* setting for the experiment was a single-period, single-agent setting in which the principal and the agent entered into a contract under which the agent agrees to provide effort and the principal agrees to provide all other factors necessary for the generation of payoffs (which are all that can be observed by the principal). Information asymmetry was introduced whereby the principal, not the agent, had access to superior information. The principal's problem is to decide whether to incur additional cost to provide information to the agent. The evaluation of this information was not made to improve contracting, but rather to improve the principal's expected payoff by influencing the agent's effort level decision through the introduction of new information.

The first model tested was based on an expected-utility theory representation of information evaluation behavior. Because model-based research in managerial accounting relies on an expected utility representation of behavior, the descriptive validity of this model is important if this research is to be interpreted as positive or descriptive.[1] The expected utility model is a deductive model, i.e., the predictions of the model are derived from a set of primitive assumptions (axioms) about human choice behavior in environments characterized by uncertainty [Demski, 1980].[2] The other models tested were models that have been derived inductively from prior research on human judgment and decision making. Tests of these models became relevant when it was found that the expected utility model was unable to account for our results. The model most directly in competition with the expected utility model is one based on Kahneman and Tversky's prospect theory [1979]. Prospect theory was developed to account for preferences which systematically violate the axioms of expected utility theory and thus seeks to provide a more adequate descriptive theory of choice under uncertainty.

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[1] Our use of the term "positive" is consistent with the usage of the term by Watts and Zimmerman [1979, p. 273] in that we seek theory to explain observed phenomena. Christenson [1983, p. 7] suggests that the word "empirical" be substituted for "positive" in such instances.

The remaining models tested were based on the application of algebraic composition rules [Krantz and Tversky, 1971] to describe information evaluation behavior. One model tested assumed a linear composition rule. The appeal of the linear model is its simplicity and the empirical support that it has garnered in research based on the Lens Model paradigm (see, e.g., Libby and Lewis [1982]). An alternative model tested assumed a multiplicative composition rule. Support for such a model of information evaluation was reported by Schepanski and Uecker in an *IE-DM* setting [1983] and by Shanteau and Anderson in a single-person decision theory setting [1972].

The tests of alternative models of information evaluation behavior also may be viewed as tests of alternative *P-A* models of information evaluation, because it is the combination of the setting (task environment) and the assumed model of behavior of the individuals within that setting which gives rise to testable predictions. Tests of *P-A* theory thus are joint tests of the descriptive validity of characterizing the relationship among individuals of interest, e.g., accountants and decision makers, as a *P-A* relationship and the descriptive validity of the assumed model of individual behavior within that relationship. Consequently, when a *P-A* model fails to account for observed phenomena the cause of the discrepancy may be the inappropriate characterization of the relationship or the misspecification of the model of individual behavior or both. We avoid the jointness problem by predetermining the relationship and testing alternative models of individual behavior. Our results thus have the potential for increasing the descriptive validity of *P-A* theory in information evaluation by improving the model of individual behavior.

The tests of the competing models are also worthy of note for, in contrast to most positive research in accounting (for exceptions, see Schepanski and Uecker [1983] and Schepanski [1983a], the emphasis is on falsification (rather than confirmation) in a way that does not require assumptions regarding initial conditions. Christenson [1983] has been severely critical of the methodology of positive research in accounting. A major focus of his criticism is the attempt to corroborate theory by deriving correct predictions from it. He points out that one difficulty with assessing the truth of a theory by identifying observations consistent with it is that certain correct predictions can be deduced from several false theories. Another is that because initial conditions must be assumed in order to make a "positive" prediction, the predictions of a theory can therefore be "adjusted" to account for observed phenomena by respecifying the initial conditions. In the case of expected utility theory, for example, such "adjustments" typically are made by respecifying the form and parameters of the utility function. Thus, tests of predictive ability such as these are weak tests and so are deemed irrelevant. Instead, he advocates an approach to theory testing described by Popper [1959]. The first step is to identify events that the theory predicts will *not* occur, because a theory can predict "negatively" without specifying initial conditions.[3] The second is to identify settings where these prohibited events are most likely to occur and to conduct tests in these settings. Tests of the theory's *negative* predictions in such settings are deemed severe tests and hence "relevant" [Christenson, 1983, p. 18].

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[2] Although much evidence already exists which points to the conclusion that expected utility theory is not descriptively valid, most of this evidence is irrelevant from a predictive or positivist point of view. Postulated computational mechanisms are not important within the positivistic view. What counts is whether the theory predicts behavior better than competing models. Tests of predictive ability capable of discriminating among competing models are, however, difficult to construct because most predictive tests require that certain initial conditions, e.g., expected value (as opposed to expected utility) maximization, be assumed. Hence predictive failures of a theory can be dismissed by attributing such failures to misspecification of initial conditions [Schoemaker, 1982, pp. 538–539]. As will be described subsequently in the text, our tests of predictive ability do not assume initial conditions.

Our tests are performed in a setting of minimal complexity in which the variables are well defined and where the subjects have an economic incentive to respond conscientiously. Consequently, it is unlikely that violations of the models' "negative" predictions will go undetected due to high response variability that might be induced by a more complex task, and/or lack of incentive, and/or inadequate surrogation of important variables. By the same token, this setting is also one where, if a particular model is an appropriate representation of behavior in information evaluation, evidence of its resistance to falsification also should be readily apparent. Thus, the results are likely to have important implications for the generalizability of the competing theories to more realistic settings involving much greater complexity.[4]

The remainder of the paper is organized as follows. In the next section the information evaluation task and experimental design are described. In the four subsequent sections, the "negative" predictions of each of the four models are derived, followed immediately by the results of the empirical tests of that model. To the extent possible, the mathematical derivations have been placed in appendices. The last two sections present discussion, conclusions, and recommendations for further research.

METHOD

Task

Subjects in the experiment performed the role of the principal whose task was to assess the value of additional information to be provided to the agent (a hypothetical individual). The experiment consisted of four separate parts.[5] In part one, subjects (principals) were given the option to purchase information for the agent by specifying the maximum amount that they would be willing to pay for a *single* marble drawn at random from one of two urns containing a large number of black

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[3] Testing theories without specifying initial conditions alternatively has been described as a testing approach which evaluates the *qualitative* predictions of a theory [Schepanski 1983a, 1983b].

[4] There is a subtlety in this statement that is often overlooked. The realism (or representativeness) of the experimental task is not at issue in research, like the present study, aimed at testing competing theories. After all, it is the *theory* one seeks to generalize, not the experimental task setting. The purpose of the experimental task is to permit as unambiguous a test of competing theories as possible. As long as that task is within the scope of the theories being tested, i.e., the theories are expected to hold in the experimental task environment, the representativeness of the task is unimportant. See Swieringa and Weick [1982, pp. 79-88] for an elaboration of this point.

[5] A complete set of instructions for each part of the experiment is available from the authors upon request.

FIGURE 1

EXAMPLE OF PRINCIPAL'S INFORMATION EVALUATION TASK

		STATES	
		95%B	*5%B*
Agent's Action Choice:	"95%B"	$35	$0
	"5%B"	$0	$35

Prior Probabilities : P(95%B) = .57; P(5%B) = .43
Accuracy : X%B = 95%B; Y%B = 5%B
Required Effort : "5%B" Equal to "95%B"
*Max Purchase Price: $________

* The phrase "Min Selling Price" was substituted in the selling-price condition.

and white marbles. The result of the sample then was provided to the agent who faced the action selection problem of deciding from which urn the marble was drawn. Prior probabilities, information-system accuracy, payoffs, and the effort required by the agent to choose one action alternative as opposed to another were systematically manipulated. The levels of the independent variables are described in Appendix A. Note that information-system accuracy was operationalized as the proportion of black marbles in each urn, and that the symbols, *X%B* and *Y%B*, refer to the urn containing mostly black marbles and the urn containing mostly white marbles, respectively. No feedback was provided. An example of the information evaluation task faced by subjects is presented in Figure 1.[6]

In part two of the experiment, subjects were asked to make judgments of the value of information given a series of paired comparisons of the general form (*a*-*b*) vs. (*c*-*d*) where *a, b, c,* and *d* represented four different information evaluation cases obtained by systematically manipulating priors, accuracy, payoffs, and effort. The purpose of this part was to provide corroborating evidence of the presence (or absence) of interactive effects from part one of the experiment.

Part three of the experiment was identical to part one with the exception that principals specified the minimum amount for which they would be willing to sell information that would otherwise be provided to their agent. Part four was identical to part two except that *a, b, c,* and *d* represented minimum selling prices for information rather than maximum buying prices.

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[6] Subjects were told that their contract with their agent called for an equal sharing of the payoffs and that the payoffs used in the experiment represented their share. The optimality of this contract is easily shown. Since the agent's effort is not observable, the only feasible compensation contracts are those which depend only on payoffs. Let W and zero be the payoffs for a correct decision and incorrect decision, respectively, by the agent. Since $P(X\%B) > P(Y\%B)$, the principal prefers that the agent choose "*X%B*" because $P(X\%B)(W/2) + P(Y\%B)(0/2) > P(X\%B)(0/2) + P(Y\%B)(W/2)$. For this same reason and because the effort required to choose "*X%B*" never exceeds the effort required to choose "*Y%B*," the agent also will prefer "*X%B*." As long as $(W/2)$ is assumed to satisfy the agent's minimum expected utility requirement, the principal and the agent will be in agreement.

Administration

Subjects were 32 M.A. and Ph.D. candidates in accounting enrolled in a managerial accounting theory class. The focus of the course was information economics. Subjects had studied Demski [1980] and had completed the exercises in Uecker [1981] prior to participating in the experiment.

The experiment was completed in four separate sessions with each subject completing all four parts. The sequence in which judgments of buying prices and selling prices were obtained was counterbalanced. Thus half the subjects completed the parts 1, 2, 3, and 4 in that order. The other half of the subjects completed the four parts in the order 3, 4, 1, and 2. Only the first part of the experiment in each sequence was completed in class. Remaining parts were completed as homework assignments.

Incentives

Subjects had an economic incentive to respond conscientiously when judging the value of information because the possibility existed that they would be required to play one of the information evaluation cases for money using the responses they gave during the experiment. To save time and to limit the cost of the experiment, only a randomly selected subset of subjects actually played one of the cases. However, subjects did not know who would be selected nor which case would be played at the beginning of the experiment. The manner in which the incentive scheme was made operational is described below.

At the beginning of parts one and three of the experiment, subjects received sealed envelopes which they signed and returned unopened to the administrator. Subjects were told that four of the envelopes contained the results of a randomly selected information evaluation case—i.e., the payoff resulting from the agent's decision assuming sample information was provided and the payoff resulting from the agent's decision assuming no sample information was provided. The envelopes also contained a random number between zero and the value of perfect information for the chosen case. The remaining envelopes contained blank sheets of paper. For part one, the random numbers were interpreted as the minimum price at which information could be purchased. If a subject's maximum purchase price for information in the chosen case equaled or exceeded this number, he received the payoff resulting from the agent's decision *with* sample information minus his purchase price. If this amount was negative, i.e., the agent chose incorrectly (payoff$=0$), subjects received nothing. If a subject's maximum purchase price was less than the random number, he received the payoff resulting from the agent's decision *without* sample information.

For part three, the random numbers were interpreted as the maximum price at which the information could be sold. If the subject's selling price exceeded the random number, the information could not be sold and would be provided to the agent. Accordingly, the subject received the payoff resulting from the agent's decision *with* sample information. If the subject's selling price was less than or equal to the random number, he received his selling price and the payoff resulting from the agent's decision *without* sample information.

Subjects received their signed envelopes and a payment of five dollars upon completing all four parts of the experiment. Those subjects whose envelopes contained the simulated cases then received additional amounts as determined above. The additional payments ranged from five dollars to approximately 30 dollars.

Design

Three levels of accuracy (*AC*), priors (*PR*), and payoffs (*PO*), and four levels of effort (*EF*) were systematically manipulated in an orthogonal design. This design resulted in a total of 108 ($3\times3\times3\times4$) information evaluation cases which were randomized individually for each subject. Subjects completed these cases twice, once specifying their maximum purchase price for information (part 1) and once specifying their minimum selling price (part 3). Main effects for the order of administration were not statistically significant ($p>.05$) for either the buying price or selling price conditions. Of 28 possible interaction effects involving order of administration, only four were statistically significant ($p<.05$). Consequently, subjects' responses in the two orders of administration were pooled for purposes of subsequent analyses.

Initial analyses of the buying and selling price responses disclosed that nine of the 32 subjects reversed their interpretation of the effect of the effort variable on the value of information. When the levels of the effort variable were ranked according to the mean judgments of buying and selling prices, the rankings provided by the nine subjects were exactly opposite to the rankings provided by the other 23 subjects. The mean buying and the mean selling price of the nine subjects were greatest when the effort required by the agent to select "*Y*%*B*" was much greater than the effort required to select "*X*%*B*" and smallest when the effort required by the agent to select "*Y*%*B*" was equal to the effort required to select "*X*%*B*." Normatively, and consistent with the mean judgments of the other 23 subjects, buying and selling prices should be smallest in the former case and greatest in the latter. Because the rankings of the effort variable provided by both groups of subjects were highly systematic and because separate analyses of the responses of the two groups resulted in the same substantive conclusions, the judgments of each of the nine subjects on the effort variable were reversed and merged with the judgments of the other 23 subjects to simplify the presentation of the results of the subsequent analyses.[7]

The design for parts two and four of the task consisted of cases in which subjects made judgments of paired comparisons. An example of this judgment task is given in Figure 2. There were 24 cases in the buying price condition (part 2) and the same 24 cases in the selling price condition (part 4). The cases were constructed so that paired comparisons between the extreme levels of all the independent variables (see Appendix A) would be obtained. For example, in Figure 2, (*a-b*) is the comparison between the highest and lowest levels of the accuracy variable at one extreme level of the prior probability variable and (*c-d*) is the comparison between the highest and lowest levels of the accuracy variable at the other extreme level of the prior probability variable. Several cases also included paired comparisons between extreme and intermediate levels of the independent variables. The 24 cases were randomized individually for each subject. The nine subjects who reversed themselves on the effort

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[7] There are 24 possible orderings of the four levels of the effort variable. Therefore it is extremely unlikely that completely opposite rankings could be obtained by chance with both buying price and selling price judgments. Separate ANOVAs of the responses of the two groups disclosed statistically significant main effects for all factors and similar patterns of statistical significance for the interaction effects.

FIGURE 2

EXAMPLE OF PAIRED COMPARISON JUDGMENT TASK

LEFT-HAND PAIR	*RIGHT-HAND PAIR*
(a) Prior Prob.: $\begin{bmatrix} P(X\%B)=.87 \\ P(Y\%B)=.13 \end{bmatrix}$ Accuracy : [95%B; 5%B]	(c) Prior Prob.: $\begin{bmatrix} P(X\%B)=.57 \\ P(Y\%B)=.43 \end{bmatrix}$ Accuracy : [95%B; 5%B]
(b) Prior Prob.: $\begin{bmatrix} P(X\%B)=.87 \\ P(Y\%B)=.13 \end{bmatrix}$ Accuracy : [65%B; 35%B]	(d) Prior Prob.: $\begin{bmatrix} P(X\%B)=.57 \\ P(Y\%B)=.43 \end{bmatrix}$ Accuracy : [65%B; 35%B]

VARIABLES HELD CONSTANT

EFFORT: "Y%B" moderately greater than "X%B"
PAYOFF: $25.00

Equal
$[(a-b)>(c-d)]$ 4—3—2—1—0—1—2—3—4 $[(c-d)>(a-b)]$

variable in parts one and three also reversed themselves on the effort variable in parts two and four. Consequently, their responses on the effort variable were reversed and merged with the other 23 subjects to simplify the presentation of the results of the subsequent analyses.

THE EXPECTED UTILITY MODEL

Predictions of the Expected Utility Model

In the single-period, two-state, information evaluation task employed in the experiment, the expected utility (*EU*) model predicts that subjects (principals) behave *as if* they determine a critical value for a posterior odds ratio which, if exceeded, causes them to judge the value (buying or selling price) of information to be greater than zero. If the critical posterior odds ratio is not exceeded, they judge the value of information to be zero. The critical posterior odds ratio is based on the subjects' perception of the agent's trade-off between the incremental utility the agent derives from decreased effort and the incremental utility he derives from the payoff for a correct decision. The agent's effort level (*EF*) was described to subjects in terms of this trade-off (Appendix A). In Appendix B, we show that the critical posterior odds ratio is $(1+EF)/(1-EF)$ where *EF* denotes the effort required by the agent to choose "*Y%B*."

Intuitively, the critical posterior odds ratio represents a value at which the subject perceives the agent to be indifferent between the choice of "*X%B*" and "*Y%B*" given that the marble sampled is white. If this ratio is not exceeded, the agent will choose "*X%B*" which is the same choice the agent would make without sample information. Consequently, sample information would be worthless in this instance because it would have no effect on the agent's decision. If the ratio is exceeded, the agent will choose "*Y%B*" if a white marble is drawn and "*X%B*" if a black marble is drawn. The critical posterior odds ratio thus acts as a binary switch to determine whether or not sample information has value. The role of the critical posterior odds ratio is apparent in the EU model which is derived in Appendix B and is presented below for a single combination of priors, accuracy, payoffs, and effort.

$$E(U|\eta)-E(U|a^*)=0 \text{ whenever } \left[\frac{P(s_2)}{P(s_1)}\right]\cdot\left[\frac{P(y_2|s_2,\eta)}{P(y_2|s_1,\eta)}\right] \leq \frac{1+EF}{1-EF}, \text{ otherwise}$$

$$E(U|\eta)-E(U|a^*)=\{U[f(s_1,a_1)]-U[f(s_2,a_1)]\}\cdot\{[P(y_2|s_2,\eta)]-[P(s_1)]\}, \tag{1}$$

where

$E(U|\eta)$ = the principal's expected utility for payoffs if the agent makes his decision with sample information,

$E(U|a^*)$ = the principal's expected utility for payoffs if the agent makes his decision without sample information,

$[P(s_2)/P(s_1)]$ = the prior odds ratio that s_2 will be obtained [$P(s_2)=P(Y\%B)$; $P(s_1)=P(X\%B)$],

$[P(y_2|s_2,\eta)/P(y_2|s_1,\eta)]$ = the likelihood ratio for the drawing of a white marble [$P(y_2|s_2,\eta)=P(\text{white marble}\,|\,Y\%\text{B})$;

$P(y_2|s_1,\eta)=P(\text{white marble}\,|\,X\%\text{B})$],

EF = the effort required by the Agent to choose "$Y\%B$" expressed as the ratio of the agent's incremental utility from decreased effort in choosing "$X\%B$" to the incremental utility of a correct decision (see Appendix A),

$U[f(s_1,a_1)]$ = the principal's utility for the payoff for a correct decision. [a_1 = agent chooses "$X\%B$"], and

$U[f(s_2,a_1)]$ = the principal's utility for the payoff of zero for an incorrect decision.

To facilitate a common notation for all of the models tested and to formulate the *EU* model in the context of our factorial design, we employ the following notation in which subscripts refer to levels of the different factors.

$$\Psi_{defg}=0 \text{ if } \left[\frac{1-s_{PR_e}}{s_{PR_e}}\right]\cdot\left[\frac{s_{AC_d}}{1-s_{AC_d}}\right] \leq \left[\frac{1+s_{EF_g}}{1-s_{EF_g}}\right],$$

otherwise

$$\Psi_{defg}=f(s_{PO_f}, s_{AC_d}, s_{PR_e})>0, \tag{2}$$

where

Ψ_{defg} = the subjective value of sample information corresponding to $E(U|\eta)-E(U|a^*)$ in equation (1),

s_{AC_d} = the subjective value of the accuracy of sample information corresponding to $P(y_2|s_2,\eta)$ in equation (1),

s_{PR_e} = the subjective value of prior probabilities corresponding to $P(s_1)$ in equation (1),

s_{PO_f} = the subjective value of payoffs corresponding to $(U[f(s_1,a_1)]-U[f(s_2,a_1)])$ in equation (1), and

s_{EF_g} = the subjective value of the required effort corresponding to *EF* in equation (1).

The *EU* model assumes a conditionally monotone transformation from Ψ to R, the subject's buying or selling price response that is observed. In general, the arguments of this transformation are the subject's utility function, U, and his initial wealth position, U_0. Thus $R_{defg}=M(\Psi_{defg}|U_0)$, where $U_0=E(U|a_1)_{ef}$ in this experiment and M is a monotone function.[8]

The *EU* model in equation (2) makes two qualitative predictions that enable it to be tested while allowing for subjective values of model parameters. First, the effect on Ψ of varying the required effort for the agent to choose "*Y*%*B*" as opposed to "*X*%*B*" from "equal to" to "much greater than" is to increase the frequency of cases in which $\Psi = 0$. Second, if $\Psi > 0$ at a given level of agent's effort, the judged value of sample information is predicted to be identical for all lower levels of required effort. The latter follows from the fact that s_{EF} does not enter into the calculation of Ψ when $\Psi > 0$. Thus, if mean judgments are positive, differences in the value of information across levels of the effort variable can be caused only by differences in the frequency of zero responses for different levels of the effort variable. In terms of testing the theory's "negative" predictions, this implies that statistically significant differences across levels of the effort variable should *not* be observed if only positive responses are analyzed. Consequently, it should be possible to test the model for this prediction by first eliminating all zero responses from the analysis.

The second qualitative prediction of the *EU* model concerns the nature of the $PR \times AC$ interaction under differing assumptions regarding the subjects' utility functions for payoffs. If subjects' utility functions are linear, i.e., subjects are risk-neutral, a $PR \times AC$ interaction will be absent. An example of this result is plotted in panel (a) of Figure 3. If the subjects' utility functions are concave, i.e., subjects are risk-averse, it is shown in Appendix C that the $PR \times AC$ interaction must exhibit convergence. An example of this result is plotted in panel (b) of Figure 3. It follows, therefore, that if the observed $PR \times AC$ interactions are divergent as in panel (c) of Figure 3, subjects' utility functions must exhibit some form of convexity, i.e., risk seeking, to be consistent with the *EU* model.

Tests of the Expected Utility Model

Mean judgments were positive in each of the 108 cells of the experimental design for both the purchase price and selling price conditions. If $\Psi > 0$ in all cells of the design as this result suggests, then the *EU* model in equation (2) predicts that Ψ will be independent of the agent's effort. Thus for each combination of priors, accuracy, and payoffs, judgments should be observed to be the same for all levels of required effort after deleting zero responses.

This prediction was tested by performing the following analysis for both the purchase price and selling price judgments. An average was computed of subjects' positive responses (after deleting \$0 responses) for each of the 27 prior × accuracy × payoff combinations in which the agent's required effort was "much greater than." Another set of averages was computed in this manner for the same prior × accuracy × payoff combinations in which the agent's required effort was "equal to." These averages were used to compute a difference score for each combination. Assuming differences in responses among subjects are due to random error, the *EU* model predicts that the mean of these difference scores ($\bar{d}$) will not differ significantly from zero. Contrary to the predictions of the *EU* model, the mean was significantly different from

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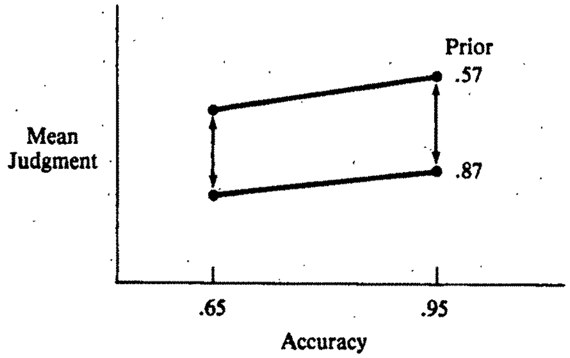
[8] The *EU* model, as well as each of the remaining models tested in this study, is represented in terms of two functional relationships. The first is a composition rule (I) to assimilate the subjective values of the independent variables into an assumed (context-free) subjective impression of sample information, Ψ, and the second is an output function (J) which transforms Ψ into R, the observed response. Thus $R = J(I(s))$ [see Schepanski, 1983b].

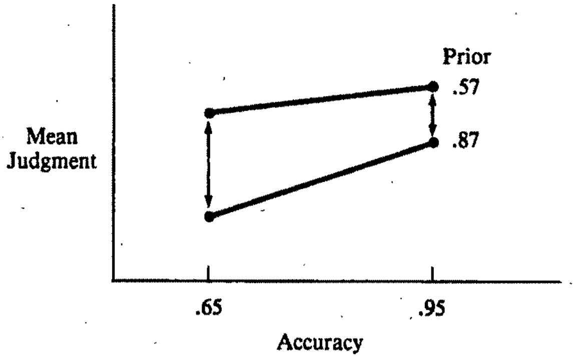
FIGURE 3

ALTERNATIVE FORMS OF PRIOR X ACCURACY INTERACTIONS

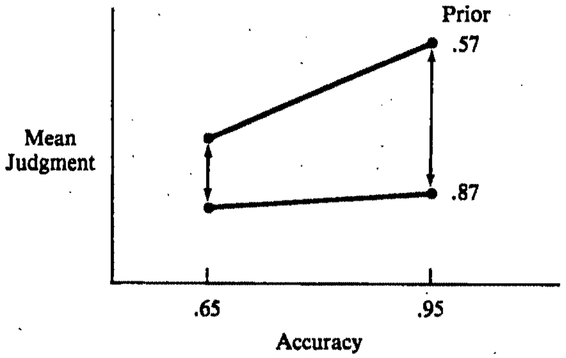
Panel (a): Parallelism (No Interaction)



Panel (b): Convergent Interaction



Panel (c): Divergent Interaction



zero for both buying price judgments ($\bar{d}=2.07$, $\alpha=.0001$) and selling price judgments ($\bar{d}=1.51$, $\alpha=.0001$).

A sensitivity analysis of the data was performed to determine whether these discrepancies from the predictions of the *EU* model might disappear if the small positive responses of each subject were reclassified as a response of zero and deleted. Positive responses less than \$1, \$2, \$3, . . . , \$10, were successively deleted and the difference-score analysis repeated. However, the mean difference scores remained significantly different from zero even after reclassifying all responses <\$7 as zero.

An analysis was performed to determine whether the aggregate results described above also characterized the individual-subject data. Each subject's purchase price and selling price judgments in the 27 prior × accuracy × payoff combinations in which the agent's required effort was "equal to" and the corresponding 27 judgments in which the agent's required effort was "much greater than" were analyzed in the following manner. First, corresponding pairs of judgments in which the subject responded zero when the agent's required effort was "much greater than" were deleted. Second, the remaining pairs of judgments of the value of information were classified as follows.

$R_{EF_1} < R_{EF_4}$,

$R_{EF_1} = R_{EF_4}$, and

$R_{EF_1} > R_{EF_4}$,

where

R_{EF_g} = the subject's buying or selling price for the specified level of the agent's required effort level (EF_1 = "equal to"; EF_4 = "much greater than").

If the data were noiseless and if ψ is independent of the agent's effort level as predicted by the *EU* model, all of the pairs of judgments should fall into the classification $R_{EF_1} = R_{EF_4}$. Allowing for noise, the number of judgments classified as $R_{EF_1} < R_{EF_4}$ should be about the same as the number classified as $R_{EF_1} > R_{EF_4}$ if the *EU* model is valid. A binomial test of this equal frequency hypothesis was conducted for each subject. For 28 of the 32 subjects, the equal frequency hypothesis was rejected at a $\alpha \leq .05$. For the remaining four subjects the equal frequency hypothesis was rejected at $\alpha \leq .10$. Thus the individual subject data are consistent with the aggregate results reported above.

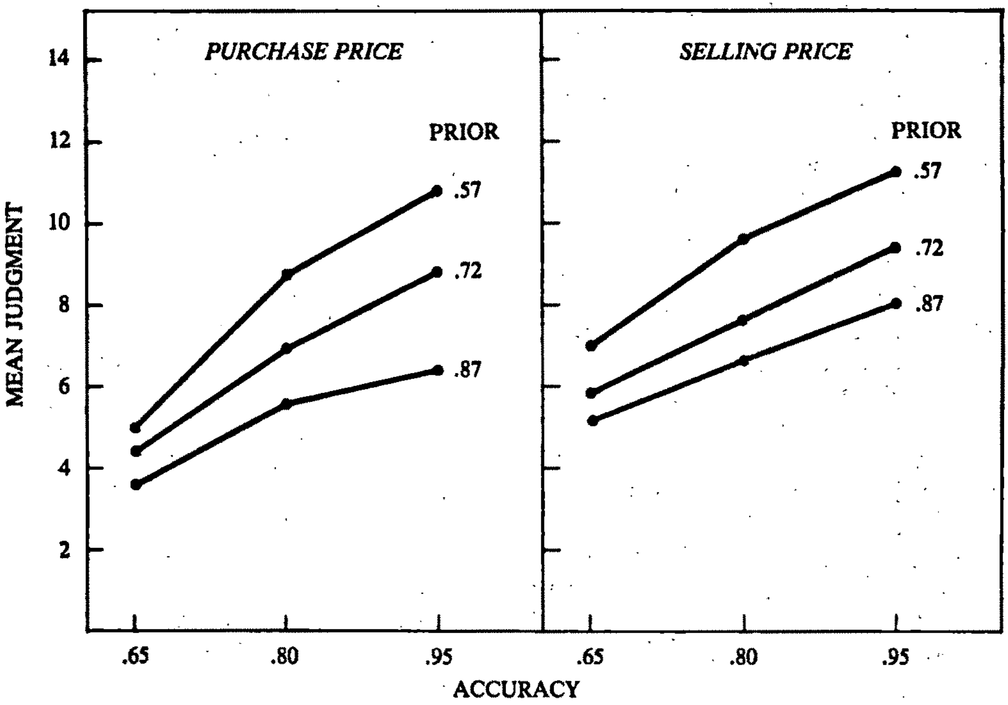
The other test of the *EU* model was based on the form of the prior × accuracy interaction. Figure 4 below presents mean judgments for priors and accuracy averaged over levels of payoff and agent's effort level for both the purchase price and selling price conditions. Note that the curves diverge to the right, i.e., they correspond to the pattern in panel (c) of Figure 3. Both of the observed prior by accuracy interactions are highly significant ($p < .01$). In addition, a test also was performed (described later in the paper) to determine whether these interactions were the result of differences in assessments in the value of information at different levels of accuracy, or were the result of other factors such as a bias produced by the particular response procedure employed in the experiment. This test indicated that the interactions in Figure 4 are "real" and cannot be dismissed as an artifact of the experimental procedure. The analysis in Appendix C shows that only if subjects' utility functions for payoffs display some form of convexity (risk-seeking) might the *EU* model be able to account for the divergent prior by accuracy interactions in Figure 4. However, the form of such a function, if it exists, is presently unknown. Thus, for any member of the class of *plausible* utility functions, the *EU* model is incapable of accounting for the prior by accuracy interactions observed in Figure 4.

THE PROSPECT THEORY MODEL

Predictions of the Prospect Theory Model

In deriving the predictions of prospect theory (*PT*) for our task we assume con-

FIGURE 4
PRIOR X ACCURACY INTERACTION



sistency of specified buying or selling prices and subjects' choices. In other words, we assume that if a subject specifies a positive price for information, the subject prefers the lottery in which the agent chooses with sample information to the lottery in which the agent chooses without sample information and, given the opportunity to make the choice rather than to specify the price, the subject would choose the lottery with sample information supplied to the agent. This consistency between prices or bids and choices has not always been observed. Indeed, Lichtenstein and Slovic [1971] and Grether and Plott [1979] have constructed pairs of prospects *A* and *B*, such that people generally prefer *A* over *B*, but sometimes bid more for *B* than *A*. Kahneman and Tversky [1979, p. 284] therefore formulated *PT* in terms of choices between specified prospects rather than in terms of prices.

In terms of the present experimental task, however, the assumption of consistency of prices and choices is an extremely weak one. This follows from the fact that in our task, the prospect with sample information provided to the agent is always weakly preferred to the prospect without sample information because the worst that can happen is that the agent (because he is effort-averse) will ignore the sample information and make the same choice with sample information as without sample information. Subjects specify a purchase price or selling price for the prospect with sample information provided to the agent. Since this price is constrained to be greater than or equal to zero, the preference reversal phenomenon cannot occur in our task. That is, only if subjects were allowed to specify *negative* prices could the preference reversal phenomenon occur.

Under the minimal assumption of consistency of specified price and choices among prospects, it can be shown by an analysis similar to the one given in Appendix B that the *PT* model has the same form as the *EU* model.[9] The *PT* model describes subjects as behaving as if they determine a critical value for a posterior odds ratio which, if exceeded, causes them to judge the value of information to be positive. Otherwise the value of sample information is judged to be zero. The critical posterior odds ratio is based on the subjects' perception of the agent's trade-off between effort and payoff. By redefining the subjective values for priors and accuracy in equation (2) to include the decision weights of *PT* (i.e., let s_{AC_d} represent $\pi P(y_2|s_2,\eta)$ and s_{PR_e} represent $\pi P(s_1)$), and be redefining s_{PO_f} to be the subjective valuation for gains, i.e., $U[f(s_1,a_1)]$ (because $f(s_2,a_1)$ is zero and will be deleted in the editing process), the *PT* model for our task is the same as the *EU* model in equation (2). This does not imply that the subjective values will have the same magnitudes in the *EU* and *PT* models, only that the form of the model is the same.

In contrast to the *EU* model, the *PT* model does not condition the monotone transformation from Ψ to the subjects' buying or selling price response, R, on the initial wealth position. This follows from the assumed insensitivity of the value function in *PT* to the initial wealth position [Kahneman and Tversky, 1979, pp. 277–278]. Thus $R =_{defg} = M(\Psi_{defg})$ where M is a monotone function.

Because the form of the *EU* and *PT* models is the same, the "negative" prediction that differences across levels of the effort variable should *not* be observed if only positive responses are analyzed also applies to the *PT* model. However, the qualitative prediction of the form of the $PR \times AC$ interaction is different for the two models. Under the usual assumption of risk aversion, the *EU* model predicts a convergent $PR \times AC$ interaction (see Appendix C). Under the reflection hypothesis, the *PT* model assumes risk aversion in the region of gains and risk-seeking in the region of losses. Combining the reflection hypothesis with the assumption that subjects frame their choices so that the price they specify is maintained in a separate psychological account from the payoffs [Kahneman and Tversky, 1979, p. 288], it can be shown by an analysis similar to the one given in Appendix C that *PT* predicts a divergent $PR \times AC$ interaction.[10]

Tests of the Prospect Theory Model

The results of the tests of the *EU* model also apply to the *PT* model. Thus, the statistically significant differences across levels of the effort variable which were observed are also inconsistent with the *PT* model. In contrast to the *EU* model, however, the *PT* model is able to account for the divergent $PR \times AC$ interactions which were observed. Thus the *PT* model gains credibility over the *EU* model because it resisted falsification where the *EU* model could not.

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[9] A copy of the analysis which derives the principal's prospect theory model for the value of sample information is available from the authors upon request. As in Appendix B, the analysis is limited to the case where $P(s_1) > P(s_2)$ and the required effort to choose a_1 is less than or equal to the required effort to choose a_2.

[10] As in Appendix C, the analysis proceeds by determining how, for a fixed difference in prior probabilities, the difference in the price of information changes with changes in accuracy. A copy of this analysis is available from the authors upon request.

THE LINEAR MODEL

Predictions of the Linear Model

The linear model describes subjects' behavior *as if* they assimilate subjective values of the independent variables employing an additive composition rule. The linear model assumes that the subjective values of each of the levels of the manipulated variables are independent of the subjective values of the levels of other independent variables with which each is combined. In addition, it is assumed that the transformation from Ψ, as defined in equation (2), to overt response, R, is linear. That is, $R = A\Psi + C$, where A and C are constants defining the unit and zero-point of the response scale, respectively.

In contrast to the *EU* or *PT* models, the linear model is compensatory, i.e., lower subjective values for one variable can be offset by higher subjective values for another. This implies that increases in the subjective value of any independent variable, holding constant the subjective values of other independent variables, will increase the judged value of information. In the *EU* and *PT* models, increases in the subjective value of accuracy, for example, will not increase the judged value of information unless the critical value of the posterior odds ratio has been exceeded. Consequently, the *EU* and *PT* models are noncompensatory.

The linear model for the information evaluation task may be written

$$\Psi_{defg} = s_0 + s_{AC_d} + s_{PR_e} + s_{PO_f} + s_{EF_g}, \qquad (3)$$

where

Ψ_{defg}, s_{AC_d}, s_{PR_e}, s_{PO_f}, and s_{EF_g} are defined as in equation (2), and

s_0 = the subjective value of the initial impression prior to receiving information concerning the manipulated factors.

According to the linear model, the effect on Ψ of changes in the level of any of the manipulated factors should be independent of the levels of all of the other factors with which it is combined. Consequently, a plot of the data should exhibit parallelism as shown in panel (a) of Figure 3. The "negative" prediction implied here is that statistically significant interaction effects should not be observed.

Tests of the Linear Model

The presence of statistically significant interaction effects and additional data indicating that these interactions are real, i.e., not an artifact of the experimental design or response procedure employed, would represent very strong evidence against the linear composition rule. A repeated-measures analysis-of-variance of both the purchase price and selling price conditions revealed highly significant ($\alpha < .05$) interactive effects between the independent variables (buying price: $AC \times PR$, $AC \times PO$, $AC \times EF$, $PR \times PO$, $PO \times EF$, $AC \times PO \times EF$, and $AC \times PR \times PO \times EF$; selling price: $AC \times PR$, $AC \times PO$, $PR \times PO$, $PO \times EF$, and $AC \times PR \times PO$). All of the interactions between pairs of independent variables were ordinal in nature and displayed a pattern of divergence similar to that in panel (c) of Figure 3 and to those observed between priors and accuracy (see Figure 4).

It is possible that these interactions are the result of various aspects of the experimental procedure, such as the type of response procedure employed, rather than real differences in assessments of the value of information when the levels of the other manipulated factors change. This hypothesis can be illustrated with panel (c) of Figure 3 which displays a divergent interaction of the type obtained in this experiment. The figure shows that the difference in mean judgment between $PR = .57$ and $PR = .87$ is greater when accuracy is high (.95) than when it is low (.65). According to the linear model, however, these differences should be subjectively equal. This equality can be tested by having subjects judge these differences directly. This procedure only requires that subjects be capable of making ordinal comparisons and so provides a particularly strong test of the model.

In parts two and four of the experiment, subjects provided direct judgments of two-factor interactions, holding constant the values of the remaining two variables. An example of subjects' task was given in Figure 2. Note that this test does not require using metric information in subjects' responses. That is, information on the *degree* to which the difference between one pair exceeds that of another is not used in the test.

In each response condition, there were over three times as many direct judgments consistent with divergence as there were direct judgments implying convergence (1,030 vs. 309 over both response conditions, $p < .001$, binomial test).[11] According to the linear model, however, the number of direct judgments implying divergence should be equal to the number implying convergence. These results provide strong evidence that the interactions observed in parts one and three of the experiment reflect real differences in assessments of the value of information and, therefore, that the linear model is not an appropriate representation of subjects' behavior in information evaluation.[12]

THE MULTIPLICATIVE MODEL

Predictions of the Multiplicative Model

The multiplicative model makes the same assumptions concerning the independence of subjective values and the transformation from Ψ to R as does the linear model. However, the assumed composition rule in this model is multiplicative. Thus, if subjective values are positive, the effect of a change in the level of an independent variable, e.g., information system accuracy, is predicted to be greater when the subjective values of other independent variables are high than when they are low. For example, the model predicts than an increase in information system accuracy when prior uncertainty is high will have a greater impact on the judged value of information than when prior uncertainty is low. The intuition here is appealing because when prior uncertainty is high, the potential benefits of more accurate information are greater than when prior uncertainty is low. As the foregoing suggests, the multiplicative model is compensatory because the effect of a lower subjective value for one variable can, in principle, be offset by higher subjective values for other variables.

The multiplicative model for the present information evaluation task may be written

$$\Psi_{defg} = (s_0)(s_{AC_d})(s_{PR_e})(s_{PO_f})(s_{EF_g}), \qquad (4)$$

where all terms are as previously defined.[13]

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[11] To provide cross-validation of subjects' direct judgments of interactions, we compared the consistency of their direct judgments in the 24 cases with the corresponding cases from the ANOVAs. Mean direct judgments of interactions in all of the 48 cases (24 with buying prices and 24 with selling prices) were consistent with divergent interactions. Plots of the corresponding interactions from the ANOVAs displayed the same pattern of divergence in 23 out of the 24 cases for subjects' purchase price judgments and for 21 out of the 24 cases for subjects' selling price judgments.

[12] In experimental designs in which the type and/or number of cues are held constant, as is the case here, the linear model is indistinguishable from the constant-weight averaging model [Anderson, 1974]. For the present task, the latter model may be written

$$\Psi_{ijkm} = w_0^* s_0 + w_{PR}^* s_{PR_i} + w_{AC}^* s_{AC_j} + w_{EF}^* s_{EF_k} + w_{PO}^* s_{PO_m},$$

where the w^*s are relative weights which are assumed to sum to one. Accordingly, the conclusions drawn here with respect to the linear model apply equally well to the constant-weight averaging model.

[13] For the same reasons as given in footnote 12 in connection with the linear and constant-weight averaging

The multiplicative model predicts interactive effects between the independent variables. Consequently a "negative" prediction of the model would be the absence of significant interactive effects. Unfortunately, an unambiguous test of this "negative" prediction is not always possible because there may exist alternative explanations for the absence of statistically significant effects. In a multiple-factor analysis-of-variance, for example, higher-order interactions are based on fewer observations per cell than are tests of main effects or two-way interactions and so the absence of statistical significance may be due to a lack of statistical power.

An alternative "negative" prediction for which an unambiguous test can be made is that the form of the two-way interactions (convergent or divergent) in the purchase price condition be different from the form of the corresponding two-way interactions in the selling price condition. Previous research [Birnbaum and Stegner, 1979] found that when subjects adopted the point of view of a buyer and recommended buying prices, divergent interactions were observed. When the same subjects adopted the point of view of a seller and recommended selling prices, convergent interactions were obtained while the ordering of the main effects remained unchanged. Changes in the form of the interaction such as this cannot be accounted for by the multiplicative model. This follows from the fact that the multiplicative model requires that the subjective values for the independent variables be positive to account for divergent interactions. However, negative subjective values would be required to account for convergent interactions. Consequently, differences in the form of significant two-way interactions in the buying and selling price conditions would represent evidence inconsistent with the predictions of the multiplicative model.

Tests of the Multiplicative Model

The analysis-of-variance of subjects' buying and selling prices show that nine of the 12 two-way interactions but only three of the ten higher-order interactions were statistically significant ($\alpha < .05$). The absence of statistical significance weakens the case for the multiplicative model. Indeed, the present results are consistent with a compound model in which pairs of factors are assumed to be assimilated multiplicatively and an additive rule is used to combine the resultant products. However, it is difficult to know how seriously one should take the absence of a greater number of higher-order interactions because this may be due to a lack of power of the test.

Better evidence of the model's ability to resist falsification is that all six of the possible two-way interactions displayed the *same* pattern of divergence in both the purchase price and selling price conditions. This finding also was confirmed at the individual subject level. As reported earlier, the number of judgments that interactions were divergent was more than three times the number of judgments that interactions were convergent in each point-of-view condition.[14] Thus the multiplicative model (or some variant thereof, such as the compound additive/multiplicative model referred to earlier)

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models, in this study the multiplicative model cannot be distinguished from the geometric averaging model [Schepanski, 1983a], a model in which the exponent of one in each term of equation (4) is replaced with w^* as per footnote 12.

[14] These results also are consistent with the hypothesis that a point of view manipulation did not occur. However, this hypothesis is contradicted by the fact that an analysis-of-variance including point of view as a within-subjects factor revealed a significant main effect for point of view ($p < .10$).

gains additional support inasmuch as it resisted falsification.

DISCUSSION

Theoretical Implications

The data from this experiment were found to be inconsistent with the predictions of the *EU* and *PT* models in equation (2) and the linear model in equation (3). Neither the *EU* model nor the *PT* model could account for the significant variation in subjects' judgments across levels of the effort variable. Their failure in this respect can be attributed to the fact that they are noncompensatory models, whereas subjects' judgments exhibited a compensatory property. The *EU* model also was unable to account for the highly significant divergent prior by accuracy interaction under the assumptions of risk aversion or risk neutrality. However, prospect theory's reflection hypothesis combined with a framing assumption allowed the *PT* model to account for the divergent prior by accuracy interaction. Thus, our results provide empirical support for prospect theory over expected utility theory and suggest that subsequent development of prospect theory be directed toward making it compensatory as opposed to noncompensatory in nature.

The linear model, because it is a compensatory model, was able to account for the significant main effects for the effort variable that could not be accounted for by either the *EU* or *PT* models. However, the highly significant interaction effects which were observed are inconsistent with the predictions of the linear model.

A previous study in an *IE-DM* setting by Schepanski and Uecker [1983] found that subjects' positive judged worths varied significantly as a function of the form of the decision maker's model in a manner similar to that observed for agent's effort in this experiment. That study, as well as studies in an individual decision maker setting by Shanteau and Anderson [1972] and Wendt [1969] found highly significant divergent interactions between priors and accuracy. The accumulation of evidence from this and other task settings points to the conclusion that principals' behavior in information evaluation cannot be represented well by expected utility theory, prospect theory, or the assumptions of the linear model.

Consistent with much of previous research in human information processing, we found that a relatively simple set of assumptions could provide a better account of the data than did the *EU*, *PT*, or linear models. These assumptions could account for data which were also consistent with the models above as well as data which were inconsistent with these models. Among these assumptions was a multiplicative composition rule to assimilate priors, accuracy, payoffs, and agent's effort. The multiplicative composition rule gained additional support from this study because one part of this experiment was designed to provide the model with a "severe" test of the type referred to by Christenson [1983]. Consequently, while the evidence in the present study was not entirely consistent with the model, the present results, when combined with the evidence from previous research [Schepanski and Uecker, 1983; Shanteau and Anderson, 1972; and Wendt, 1969], warrant serious consideration of the simple multiplicative representation as a positive theory of information evaluation.

A possible theoretical basis for the multiplicative model assumes an underlying psychological representation of the information cues in which the levels of any single cue are located along each of several subjective dimensions having a common zero point but a different unit of measurement. The number of dimensions is defined by the number of combinations of the other independent variables. It is assumed that the locations of the cue levels along each of the dimensions are linearly related. This can be illustrated simply for two independent variables, information system accuracy (three levels), and prior uncertainty (three levels). Thus, information system accuracy is assumed to be located as points along three dimensions defined by the three levels of prior uncertainty. The subjective spacing between levels of accuracy would be greatest when prior uncertainty is high and least when prior uncertainty is low (reflecting the fact that the effect of a unit change in information system accuracy on impressions of the value of information is greatest when prior uncertainty is high and least when it is low). The spacing along one dimension is related to the spacing along another by a similarity transformation. The extension to three or more independent variables is straightforward.

It should be emphasized that the foregoing interpretation does not assume that subjects multiply the subjective values of the information cues. What is being assumed is the manner in which subjects internally represent information stimuli. The status of the multiplicative model is "as if" only. What is being asserted is that if the foregoing correctly describes the process by which subjects internally represent stimuli, observed behavior will be accounted for well by the multiplicative composition rule. On the other hand, it would be premature to regard the present evidence as conclusive with respect to the multiplicative representation since other simple models may be found capable of accounting for divergent interactions. While the present results favor the multiplicative representation over the alternatives tested, a more precise theoretical representation of information evaluation behavior must await further research.

Methodological Implications

Because of the central importance of the *EU* model in principal-agent research, it is useful to consider the generalizability of the present results as well as some alternative assumptions that might enable the *EU* model to account for the present results. With regard to generalizability, our choice of subjects and task biased the experiment in favor of the *EU* model. Subjects had studied normative models of information evaluation and principal-agent theory and so were familiar with the normative principles of information evaluation. The task was simple so that cognitive demands upon subjects were minimized. In this respect, our test of the *EU* model did not possess the second characteristic described previously (see p. 433) for a "severe" test. But since the *EU* model failed without it, it was obviously unnecessary. However, its failure in *this* environment, one conducive to its support, seriously impairs its plausibility in other environments less conducive to its support.

Two justifications for the observed discrepancies which would maintain the validity of the *EU* model could be offered. First, it could be hypothesized that the observed discrepancies reflect the fact that the *EU* model tested in this research did not explicitly include disutility for cognitive effort. However, the precise manner in which it should be included is far from obvious and has yet to be formally proposed in the literature. This would seem to suggest that it may not be possible to modify the *EU* model in a parsimonious manner to account for discrepant results such as those obtained in this study.

A second hypothesis is that subjects

lacked incentive to behave in accord with *EU* theory. However, the present results are consistent with prior research that has shown repeatedly that incentives fail to eliminate suboptimal behavior [Schoemaker, 1982, pp. 553–554], which indicates that the discrepancies are cognitive, not motivational. Moreover, to continue to invoke the hypotheses of cognitive effort and incentives in the face of contradictory evidence has the effect of stripping the *EU* model of any scientific status. This follows from the fact that no conceivable evidence can ever be adduced to completely refute either of these hypotheses.[15]

Similar considerations apply to the issue of "exceptions," which was discussed by Christenson [1983]. That is, it might be argued that the predictive failures of the *EU* model observed in the present experiment should be viewed as exceptions, since the model is intended to be predictive of general trends only. For example, subjects in the present experiment, on average, judged the value of sample information to be greater as the accuracy of sample information increased. However, there are many theories that are capable of accounting for general trends. To single one out as correctly explaining behavior is totally arbitrary. The goal should be to explain the exceptions, not to dismiss them.

CONCLUDING REMARKS

This study makes the following contributions. First, it serves as a bridge from information evaluation research in an *IE-DM* setting to a *P-A* setting. Our results are consistent with those obtained in a previous study [Schepanski and Uecker, 1983] conducted in an *IE-DM* setting and thus demonstrate the generalizability of theories of information evaluation from an *IE-DM* setting to a *P-A* setting. These results provide continuity to the stream of previous information evaluation research conducted in an *IE-DM* setting.

Second, the study provides an example of rigorous testing of an explanatory theory. According to Christenson's [1983] criteria for the appraisal of an explanatory theory, previous tests of principal-agency theory were weak tests because they required that initial conditions be assumed and were directed at finding evidence consistent with the theory. The qualitative tests employed in this study required no assumption of initial conditions and were directed at finding evidence *not* consistent with the theory.

Third, the study shows that the predictive ability of *P-A* theory in the area of information evaluation can be improved by incorporating models of individual behavior other than those based upon expected utility theory. We tested three descriptive models of behavior—a prospect theory model, a linear model, and a multiplicative model. Although each model outperformed the expected utility model of information evaluation, the model that best withstood our efforts to falsify it was the multiplicative model. The multiplicative model can be interpreted as reflecting an underlying psychological representation of information in which the levels of a given cue are located along each of several dimensions having a common zero point but a different unit of measurement. Thus, the effect on impressions of information system value of a change in

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[15] It should be noted that the absence of the provision of feedback to subjects cannot be used to justify the predictive failures of the *EU* model in this experiment. Feedback permits the principal to adjust the magnitude of the posterior odds ratio that must be exceeded for information to have value. Thus, feedback affects the parameters of the *EU* model, but not its form. Since the predictive tests employed in this study do not assume initial conditions, the predictions of the model described previously remain unchanged, regardless of whether or not feedback is provided.

Appendix A
Levels of the Independent Variables

	PERCENTAGE OF BLACK MARBLES	
	X%B	*Y%B*
ACCURACY:		
1) Sample information *most* accurate:	95%B	5%B
2)	80%B	20%B
3) Sample information *least* accurate:	65%B	35%B
PRIOR PROBABILITIES:	*P(X%B)*	*P(Y%B)*
1) Correct decision without sample information *least* likely:	.57	.43
2)	.72	.28
3) Correct decision without sample information *most* likely:	.87	.13
PAYOFF FOR CORRECT DECISION:	*$C*	
1) Highest payoff for a correct decision:	$35.00	
2)	$25.00	
3) Lowest payoff for a correct decision:	$15.00	
REQUIRED EFFORT: "Y%B" ? "X%B"	Agent's incremental utility from decreased effort in choosing "X%B" is	
1) equal to	0%	
2) slightly greater than	20%	
3) moderately greater than	33⅓%	
4) much greater than	50%	
	of the incremental utility he derives from the increased payoff for a correct decision.	

the level of a given cue will vary proportionately according to the dimension on which the cue is located.

Fourth, our results provide support for prospect theory over expected utility theory and also provide guidance for further development of prospect theory. In particular, our results support the recommendation that prospect theory be modified to render it compensatory as opposed to noncompensatory.

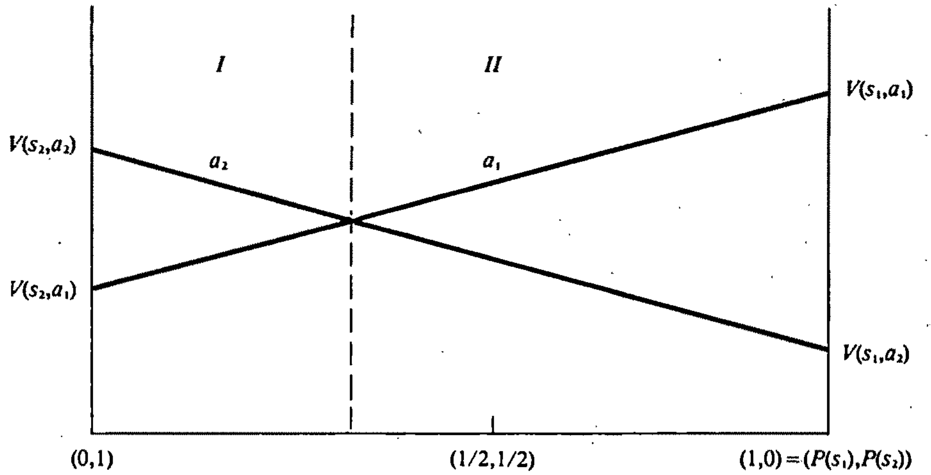
Appendix B

In this appendix we derive the principal's expected utility for the value of sample information. Because of the characteristics of the task employed in this experiment, we can limit the analysis to the case where $P(s_1) > P(s_2)$ and the required effort to choose a_1 is less than or equal to the required effort to choose a_2. For simplicity of notation, define

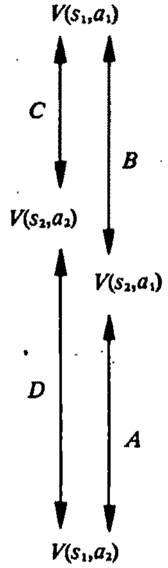
$$V(s_i, a_j) = V(f(s_i, a_j)) \text{ for all } i = 1,2 \text{ and } j = 1,2,$$

$$\begin{aligned} V(s_2, a_1) - V(s_1, a_2) &= A, \\ V(s_1, a_1) - V(s_2, a_1) &= B, \\ V(s_1, a_1) - V(s_2, a_2) &= C, \text{ and} \\ V(s_2, a_2) - V(s_1, a_2) &= D, \end{aligned} \tag{B1}$$

FIGURE B1



where V is the Agent's utility function. The relationships among these utility differentials are illustrated below.



By inspection, $(A+C)$ is the Agent's incremental utility from decreased effort and $(B+D)$ is the Agent's incremental utility from increased payoff for correct decisions. In the experiment, the Agent's required effort was described as the ratio $(A+C)/(B+D)$ (see Appendix A). Below we show how this ratio determines the magnitude of a posterior odds ratio which must be exceeded for sample information to have value.

For the agent, the expected utilities of taking each action are represented in Figure B1. The horizontal axis shows all the possible combinations of prior probabilities. The two lines crossing each other inside the diagram represent the expected utility of taking either a_1 or a_2 for each set of prior probabilities denoted on the horizontal axis. The same diagram applies for the posterior probabilities. Simply substitute posterior probabilities for prior probabilities on the horizontal axis.

When $P(s_1)>P(s_2)$, the prior odds ratio ($\Omega=P(s_2)/P(s_1)$) falls in area II and a_1 is preferred to a_2. For sample information to be valuable, the posterior odds ratio (Ω'), where $\Omega'=P(s_2|y,\eta)/P(s_1|y,\eta)$, must fall in area I. Let ℓ be the posterior odds ratio for which the agent is indifferent between a_2 and a_1. Then $\Psi=0$ if $\Omega'\leq\ell$, and $\Psi>0$ if $\Omega'>\ell$. Let P_1' and P_2' be the posterior probabilities of s_1 and s_2, respectively. Then the condition for $\Psi>0$ can be written as

$$P_1' V(s_1,a_1)+P_2' V(s_2,a_1)<P_1' V(s_1,a_2)+P_2' V(s_2,a_2). \quad \text{(B2)}$$

Since $P_1'+P_2'=1$,

$$P_2'>(V(s_1,a_1)-V(s_1,a_2))/(V(s_2,a_2)-V(s_1,a_2)+V(s_1,a_1)-V(s_2,a_1))>(A+B)/(B+D) \quad \text{(B3)}$$

by the definitions in (B1). The same condition for the nonzero value of information can be represented as

$$\Omega' = P_2'/P_1' > \ell,$$

hence $P_2' > \ell(1-P_2')$. This simplifies to

$$P_2' > \ell/(\ell+1). \quad \text{(B4)}$$

From (B3) and (B4), we get

$$(A+B)/(B+D)=\ell/(\ell+1). \quad \text{(B5)}$$

Using $B+D=B+A-A+D$ (or $=B+C-C+D$) and the fact that $A+B=C+D$, (B5) can be represented by

$$A+B=\ell(B-C)=\ell(D-A). \quad \text{(B6)}$$

By setting $A+B=1$ (i.e., $V(s_1,a_1)=1$ and $V(s_1,a_2)=0$), (B6) yields

$$B=C+1/\ell, \text{ and } D=A+1/\ell. \quad \text{(B7)}$$

Therefore,

$$B+D=A+C+2/\ell. \quad \text{(B8)}$$

Since

$$A+C=(1-B)+(1-D)=2-(B+D)=2-(A+C)-2/\ell,$$

by (B8) we get

$$A+C=1-1/\ell=(\ell-1)/\ell. \quad \text{(B9)}$$

This relationship can be rewritten as

$$1/\ell=(A+C)/(\ell-1). \quad \text{(B10)}$$

By substituting (B10) into (B8), we can represent the relationship in a multiplicative form,

$$\begin{aligned} B+D &= (A+C)+2(A+C)/(\ell-1) \\ &= \frac{\ell+1}{\ell-1}(A+C). \end{aligned} \quad \text{(B11)}$$

In the experiment, $(A+C)/(B+D)=EF$, so (B11) becomes

$$\ell=(1+EF)/(1-EF).$$

Hence the condition for $\Psi=0$ in (1) follows.

When the posterior odds ratio is not less than or equal to ℓ, i.e., $\Omega'=\Omega(LR)>\ell$ and $\Omega(1/LR)<\ell$ (these are the only possibilities since there are only two signals and two states in our task), where the prior odds ratio, Ω, is $P(s_2)/P(s_1)$, the likelihood ratio, LR, is $P(y_2|s_2,\eta)/P(y_2|s_1,\eta)$, and the reciprocal of the likelihood ratio, $1/LR$, is

$P(y_2|s_1,\eta)/P(y_2|s_2,\eta)=P(y_1|s_2,\eta)/P(y_1|s_1,\eta)$, the agent will choose a_1 if the signal is y_1 and a_2 if the signal is y_2. Let $U(s_i,a_k)=U(f(s_i,a_k))$ for all $i=1,2$ and $k=1,2$. The principal's expected utility from providing the agent with sample information is

$$\begin{aligned}E(U|\eta)&=\sum_{k=j=1}^{2}\sum_{i=1}^{2}U(s_i,a_k)P(s_i)P(y_j|s_i\eta)P(a_k|y_j,\eta)\\&=U(s_1,a_1)P(s_1)P(y_1|s_1,\eta)+U(s_2,a_1)P(s_2)P(y_1|s_2,\eta)\\&\quad+U(s_1,a_2)P(s_1)P(y_2|s_1,\eta)+U(s_2,a_2)P(s_2)P(y_2|s_2,\eta)\\&=U(s_1,a_1)P(y_2|s_2,\eta)+U(s_2,a_1)P(y_2|s_1,\eta)\end{aligned}\tag{B12}$$

by the symmetry of payoffs and likelihoods. Then equation (1) for any combination of priors accuracy, payoffs, and effort for which the value of information is positive follows:

$$\begin{aligned}&E(U|\eta)-E(U|a^*)\\&\quad=U(s_1,a_1)P(y_2|s_2,\eta)+U(s_2,a_1)P(y_2|s_1,\eta)-U(s_1,a_1)P(s_1)-U(s_2,a_1)P(s_2)\\&\quad=U(s_1,a_1)(P(y_2|s_2,\eta)-P(s_1))+U(s_2,a_1)(P(y_2|s_1,\eta)-P(s_2))\\&\quad=(U(s_1,a_1)-U(s_2,a_1))(P(y_2|s_2,\eta)-P(s_1)),\end{aligned}\tag{B13}$$

where $E(U|a^*)$ is the principal's expected utility when no information is provided to the agent.

The expected utility model for the buying price of information applies equally to the selling price. In other words, the condition for the minimum selling price to be zero is exactly the same as for the buying price. To see this, suppose the principal has information system η and $P(s_1)>P(s_2)$ as before. When this information system produces likelihood ratios such that the posterior odds ratio remains in area II, the information system is useless for incentive purposes. But if the posterior odds ratio falls in area I, the principal can increase his expected utility by supplying sample information to his Agent. Hence, if the posterior odds ratio is greater than ℓ, the principal will certainly demand a nonzero price to forego the opportunity of supplying sample information to his Agent.

APPENDIX C

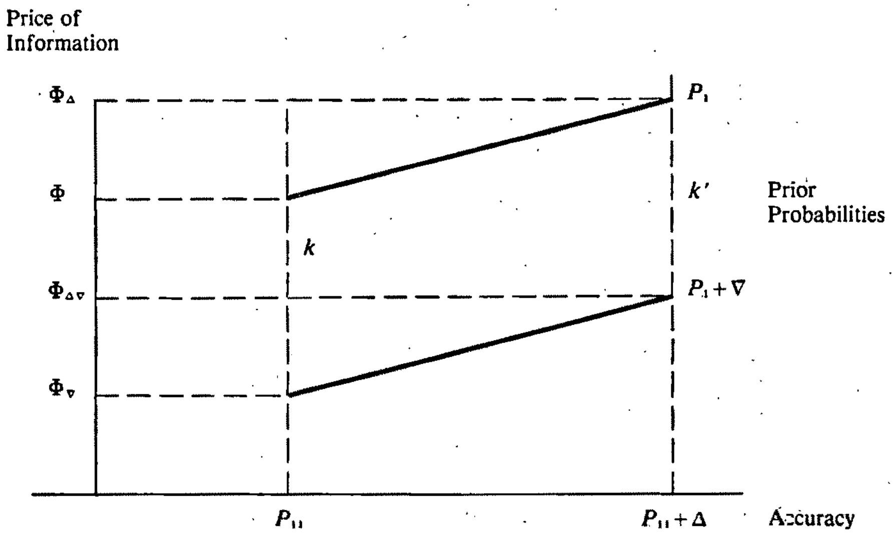
The analysis below demonstrates that a divergent $PR\times AC$ interaction for the value of sample information cannot be accounted for with a risk-neutral or risk-averse utility function. Only some risk-seeking utility functions may be consistent with this interaction. Determining the functional form of the risk-seeking utility function that could account for this interaction is beyond the scope of this analysis.

To simplify the notation, let

$$\begin{aligned}&P_{11}=P(y_1|s_1,\eta),\ P_{12}=P(y_2|s_1,\eta),\ P'_{11}=P_{11}+\Delta,\ P'_{12}=P'_{12}-\Delta,\\&P_1=P(s_1),\ P_2=P(s_2),\text{ and } P'_1=P_1+\nabla,\end{aligned}\tag{C1}$$

where Δ (or ∇) is the increase in accuracy (or prior probability). For each combination of accuracy and prior probability, let

FIGURE C1



$$\begin{aligned}
\Phi &= \text{price (buying or selling) of information for } (P_{11},P_1),\\
\Phi_\Delta &= \text{price (buying or selling) of information for } (P_{11}+\Delta,P_1),\\
\Phi_\nabla &= \text{price (buying or selling) of information for } (P_{11},P_1+\nabla), \text{ and}\\
\Phi_{\Delta\nabla} &= \text{price (buying or selling) of information for } (P_{11}+\Delta,P_1+\nabla).
\end{aligned} \tag{C2}$$

Figure C1 is provided for explanation of these symbols.

Further let $k=\Phi-\Phi_\nabla$, $k'=\Phi_\Delta-\Phi_{\Delta\nabla}$, and $\underline{c}$ be the principal's payoff from a correct (wrong) decision, respectively.

By the definition of the value of information (see equation (B13) in Appendix B), we have

$$\begin{aligned}
&P_{11}U(c-\Phi)+P_{12}U(\underline{c}-\Phi)=P_1U(c)+P_2U(\underline{c}),\\
&P_{11}U(c-\Phi_\nabla)+P_{12}U(\underline{c}-\Phi_\nabla)=(P_1+\nabla)U(c)+(P_2-\nabla)U(\underline{c}),\\
&P'_{11}U(c-\Phi_\Delta)+P'_{12}U(\underline{c}-\Phi_\Delta)=P_1U(c)+P_2U(\underline{c}), \text{ and}\\
&P'_{11}U(c-\Phi_{\Delta\nabla})+P'_{12}U(\underline{c}-\Phi_{\Delta\nabla})=(P_1+\nabla)U(c)+(P_2-\nabla)U(\underline{c}).
\end{aligned} \tag{C3}$$

Since c is held to zero in our study, (C3) can be simplified by setting $U(\underline{c})=0$:

$$P_{11}U(c-\Phi)+P_{12}U(-\Phi)=P_1U(c), \tag{C4}$$

$$P_{11}U(c-\Phi_\nabla)+P_{12}U(-\Phi_\nabla)=P_1U(c)+\nabla U(c), \tag{C5}$$

$$P'_{11}U(c-\Phi_\Delta)+P'_{12}U(-\Phi_\Delta)=P_1U(c), \text{ and} \tag{C6}$$

$$P'_{11}U(c-\Phi_{\Delta\nabla})+P'_{12}U(-\Phi_{\Delta\nabla})=P_1U(c)+\nabla U(c). \tag{C7}$$

From (C6) and (C7), we get

$$P'_{11}\{U(c-\Phi_\Delta+k')-U(c-\Phi_\Delta)\}+(1-P'_{11})\{U(-\Phi_\Delta+k')-U(-\Phi_\Delta)\}=\nabla U(c). \tag{C8}$$

Likewise, from (C4) and (C5),

$$P_{11}\{U(c-\Phi+k)-U(c-\Phi)\}+(1-P_{11})\{U(-\Phi+k(-U)-\Phi)\}=\nabla U(c). \tag{C9}$$

For simplicity, let

$$U(-\Phi_\Delta+k')-U(-\Phi_\Delta)=U'_1,\ U(-\Phi+k)-U(-\Phi)=U_1,$$
$$U(c-\Phi_\Delta+k')-U(c-\Phi_\Delta)=U'_2, \text{ and } U(c-\Phi+k)-U(c-\Phi)=U_2.$$

Then (C8) and (C9) can be written as

$$P'_{11}U'_2+(1-P'_{11})U'_1=\nabla U(c) \text{ and} \tag{C10}$$
$$P_{11}U_2+(1-P_{11})U_1=\nabla U(c). \tag{C11}$$

(C10) and (C11) must hold for all $\Delta>0$, i.e., for all P'_{11} such that $P'_{11}>P_{11}$.

Suppose $U'_1\geq U_1$ and $U'_2\geq U_2$. Further suppose $k'\geq k$. From (C10) and (C11),

$$\begin{aligned}&P'_{11}U'_2+(1-P'_{11})U'_1-\{P_{11}U_2+(1-P_{11})U_1\}\\&\quad=P'_{11}U'_2+(1-P'_{11})U'_1-(P'_{11}-\Delta)U_2-(1-P'_{11}+\Delta)U_1\\&\quad=P'_{11}(U'_2-U_2)+(1-P'_{11})(U'_1-U_1)-\Delta(U_1-U_2).\end{aligned} \tag{C12}$$

It will be shown that for some $\Delta>0$, (C12) is greater than zero, contradicting (C10) and (C11), i.e.,

$$\begin{aligned}&U_1-U_2<(1/\Delta)\{P'_{11}(U_2'-U_2)+(1-P'_{11})(U'_1-U_1)\}\\&\quad=(P'_{11}/\Delta)(U'_2-U_2)+\{(1-P'_{11})/\Delta\}(U'_1-U_1)\end{aligned} \tag{C13}$$

for some $\Delta>0$. By definition,

$$\begin{aligned}&U'_2-U_2=U(c-\Phi_\Delta+k')-U(c-\Phi_\Delta)+U(c-\Phi)-U(c-\Phi+k)\\&\geq U(c-\Phi_\Delta+k)-U(c-\Phi_\Delta)+U(c-\Phi)-U(c-\Phi+k).\end{aligned} \tag{C14}$$

The inequality holds because $k'\geq k$. Likewise

$$U'_1-U_1\geq U(-\Phi_\Delta+k')-U(-\Phi_\Delta)+U(-\Phi)-U(-\Phi+k). \tag{C15}$$

Let the right-hand side of (C14) and (C15) be U_2 and U_1, respectively. Then it is enough to show that

$$U_1-U_2<(P'_{11}/\Delta)U_2+\{(1-P'_{11})/\Delta\}U_1 \tag{C16}$$

for some $\Delta>0$.

Since

$$\frac{\partial(P'_{11}/\Delta)}{\partial\Delta}=-\frac{P_{11}}{\Delta^2} \tag{C17}$$

and

$$\begin{aligned}\frac{\partial(U_2)}{\partial\Delta}&=\{U'(c-\Phi_\Delta)-U'(c-\Phi_\Delta+k)\}\frac{\partial\Phi_\Delta}{\partial\Delta}\\&=\frac{\{U'(c-\Phi_\Delta)-U'(c-\Phi_\Delta+k)\}\{U(c-\Phi_\Delta)-U(-\Phi_\Delta)\}}{P'_{11}U'(c-\Phi_\Delta)+(1-P'_{11})U'(-\Phi_\Delta)}\end{aligned} \tag{C18}$$

where $(\partial\Phi_\Delta)/(\partial\Delta)=\{U(c-\Phi_\Delta)-U(-\Phi_\Delta)\}/\{P'_{11}U'(c-\Phi_\Delta)+(1-P'_{11})U'(-\Phi_\Delta)\}$ from

(C6), it is apparent that for a sufficiently small $\Delta>0$,

$$|\partial(P'_{11}/\Delta)/(\partial\Delta)| > |\partial(U_2)/(\partial\Delta)|. \tag{C19}$$

In fact $|\partial(P'_{11}/\Delta)/(\partial\Delta)|$ approaches infinity as Δ approaches zero. Therefore $(P'_{11}/\Delta)U_2$ can be made arbitrarily large by taking sufficiently small Δ. Likewise, $((1-P'_{11})/\Delta)U_1$ also can be made arbitrarily large by taking Δ sufficiently small. Hence, for such a small Δ, (C16) holds. This shows that either $k'<k$ holds or $U'_1<U_1$ or $U'_2<U_2$ must hold. If $k'<k$, the $PR\times AC$ interaction for the value of sample information is convergent. Suppose $U'_1<U_1$ or $U'_2<U_2$. Let U be a risk-averse utility function. Then any one of these inequalities implies $k'<k$. That is, it is not possible to have a divergent $PR\times AC$ interaction for any risk-averse utility function. Since the inequalities are strict, the divergent $PR\times AC$ interaction is also inconsistent with a risk-neutral utility function.

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The Self-Selection and Effort Effects of Standard-Based Employment Contracts: A Framework and Some Empirical Evidence

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ABSTRACT: This paper presents a framework for empirical research on the self-selection and effort effects on worker performance of standard-based employment contracts, along with the results of an experiment that tests some hypotheses derived within the framework. The framework examines how personal and contract attributes (or a worker's perceptions of them) affect the self-selection process and how self-selection and effort are interdependent. The experimental results were consistent with these hypotheses: workers select among alternative employment contracts based on their performance capability, the correlation between performance capability and performance incentives in the contract selected is higher in the presence of a controllability filter, and contract selection can explain effort effects.

A FUNDAMENTAL issue in management is how standard- or budget-based employment contracts affect worker performance [Argyris, 1952; Simon, et al., 1954; Stedry, 1960]. This issue has received considerable attention in analytical and empirical accounting research. The analytical research suggests that a standard-based employment contract can have at least two types of effects on performance. First, a standard-based contract offered in a labor market can affect performance by attracting to the organization workers with certain personal attributes (e.g., a performance-related skill) [Demski and Feltham, 1978]. This may be referred to as self-selection effects. Second, for a given set of workers, a standard-based contract can affect performance by inducing a certain level of effort [Demski and Feltham, 1978; Atkinson, 1979; Christensen, 1982; Jennergren, 1980; Baiman, 1982]. This may be referred to as effort effects. The analytical research further suggests that self-selection and effort effects are not independent, since both types of effects stem from the interrelated processes of contract design by organizations and contract selection by workers.

Most of the analytical research employs many simplifying assumptions

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about worker behavior and the environment, including expected utility maximization, costless analysis, one employer and one worker with homogeneous beliefs, a one-period world, and exogenously specified opportunity costs [Baiman, 1982]. As such, the applicability of this research is contingent upon empirical testing in settings where at least some of these assumptions are relaxed. Unfortunately, there has been a significant gap between the analytical and empirical research. The empirical studies in related areas have focused almost exclusively on the effort effects of standard-based contracts in *given* employment settings, with little or no consideration of their self-selection effects (for relevant reviews, see Ronen and Livingstone [1975], Locke, et al. [1981], and Mitchell [1982]). The empirical studies are concerned with issues such as how workers' effort and performance are affected by the standard level [Rockness, 1977; Kenis, 1979], participation in the standard-setting process [Cherrington and Cherrington, 1973; Swieringa and Moncur, 1975; Brownell, 1982a], superiors' emphasis on standards [Hopwood, 1972; Otley, 1978; Brownell, 1982b], and organizational structure [Bruns and Waterhouse, 1975; Merchant, 1981]. Although some studies have examined workers' occupation or organization selection processes [Holmstrom and Beach, 1973; Wanous, Keon and Latacki, 1983; Waller, 1985] and have recognized the importance of both organization selection and effort [Staw, 1977], none of these studies has examined the self-selection and effort effects of standard-based contracts as well as the interdependence of these effects.

In a recent empirical study, Chow [1983] provided some evidence on the self-selection and effort effects of employment contracts. Chow tested several hypotheses based on the analytical research noted above and on expectancy theory (see Mitchell [1974] and Ronen and Livingstone [1975]). His tests supported the hypothesis that, when faced with the choice of a standard-based or fixed pay contract, subjects with higher skill levels tended to select the standard-based contract while subjects with lower skill levels tended to select the fixed pay contract. He also reported limited evidence that the act of self-selection *per se* was associated with higher performance. Although his findings provide some support for the implications of the analytical research, Chow cautions that extensive further empirical research is needed. In addition to external validity problems (e.g., use of make-believe pay), Chow's study varied only two attributes of employment contracts—whether pay is standard-based and the standard level. Further, it is questionable whether the form of standard-based contract used in his study (a "bang-bang" contract, i.e., high pay for meeting or exceeding the standard and substantially lower pay otherwise) is representative of contracts in actual use. Also, because state or outcome uncertainty was not explicit in the experimental setting, it was difficult to address the effects of risk preferences. Finally, his study did not provide an explicit framework to guide empirical research.

Like Chow [1983], this study examines both the self-selection and effort effects of employment contracts. However, it extends Chow's study in five ways. First, it presents an explicit framework for identifying research issues concerning the effects of standard-based employment contracts on worker performance. The framework is used to generate five hypotheses for empirical testing. Second, the interdependence of self-selection and effort is examined in greater detail. Third, the empirical tests include an additional accounting-related attribute of employment contracts (i.e., the presence/absence of a "controllability filter" that removes from measured performance the effects of noncontrollable state factors) as well as more refined treatments of other independent variables (e.g., uncertainty about noncontrollable state factors). Fourth, this study uses a different form of standard-based contract: fixed pay plus a bonus per unit of performance over standard. Fifth, the subjects were actually paid based on their contract selections and performance.

The rest of this paper is organized as follows. The second section presents the conceptual framework and five hypotheses derived within the framework. The third and fourth sections report the method and results, respectively, of an experiment that tests the hypotheses. The last section provides a summary, discussion of the results, and suggestions for future research.

FRAMEWORK AND HYPOTHESES

Overview

Figure 1 presents a framework for examining the self-selection and effort effects of standard-based employment contracts. The framework focuses on a worker's decision about selecting an employment contract and the interdependence of contract selection and effort.[1] Each worker brings to this decision his or her particular mix of personal attributes, including skills, preferences regarding effort exertion, preferences regarding psychological and monetary compensation, and risk preferences. The available employment contracts offered by employers may differ in numerous respects, including the type of rewards (e.g., monetary or nonmonetary), determination of compensation (e.g., standard-based or fixed pay), measurement of performance (e.g., whether an employee is held accountable only for controllable factors), standard level, and organizational climate (e.g., degree of participation in the standard-setting process). A worker evaluates the match between his or her self-perceived personal attributes and the perceived attributes of the available employment contracts and selects a contract as if he or she maximizes subjective expected utility (*SEU*).[2]

Contract selection is followed by the worker's effort exertion, and the worker's skill and effort levels, along with noncontrollable state factors, jointly determine performance. In turn, measured performance and the selected contract jointly determine the worker's rewards. When the selected contract has a controllability filter (e.g., a flexible budget that adjusts for noncontrollable volume effects on total costs), any direct effects of state factors on performance are removed as a part of performance measurement, as represented by the dashed arrow in Figure 1.

The two subsections that follow discuss self-selection effects and the interdependence of self-selection and effort effects, respectively. In the first subsection, three hypotheses about the roles of certain worker and contract attributes in the contract selection process are stated. In the second subsection, two hypotheses about the interdependence of self-selection and effort effects are stated.

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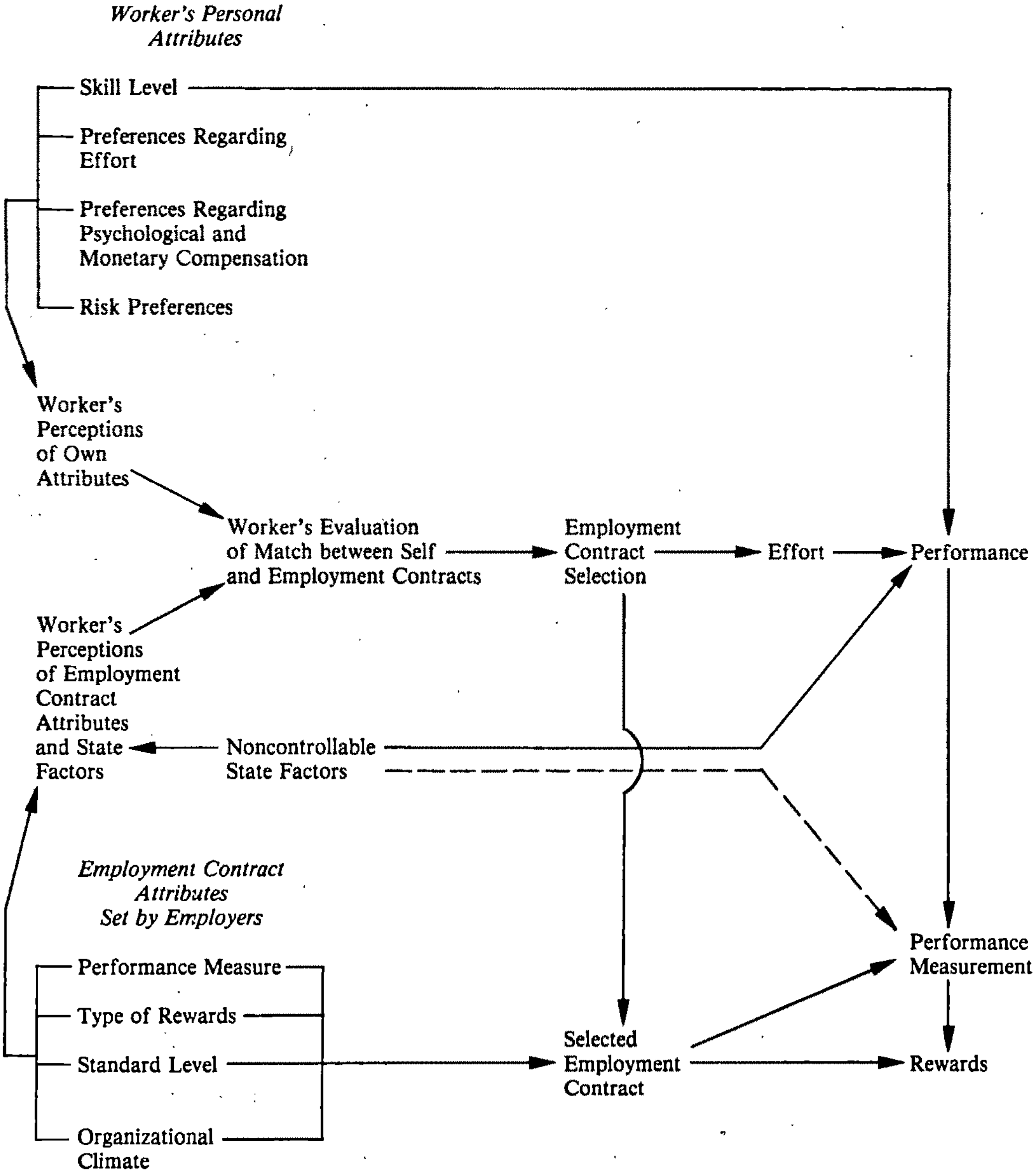
[1] The paper's framework and experiment do not examine directly the employer's design of an employment contract to offer in the labor market. The intent here is to explain how workers select from among available contracts rather than to predict the contracts that emerge in market settings. Such explanations are likely to facilitate the design of effective contracts.

[2] *SEU* maximization is assumed in order to facilitate the development of hypotheses. The framework perhaps would be improved by employing a decision theory with greater predictive ability than *SEU*, such as prospect theory [Kahneman and Tversky, 1979] or weighted utility theory [Chew and Waller, 1984]. However, such refinements are left for future research.

FIGURE 1
A FRAMEWORK FOR EXAMINING THE SELF-SELECTION AND EFFORT EFFECTS OF EMPLOYMENT CONTRACTS


Worker's Personal Attributes
Skill Level
Preferences Regarding Effort
Preferences Regarding Psychological and Monetary Compensation
Risk Preferences
Worker's Perceptions of Own Attributes
Worker's Evaluation of Match between Self and Employment Contracts
Employment Contract Selection
Effort
Performance
Worker's Perceptions of Employment Contract Attributes and State Factors
Noncontrollable State Factors
Employment Contract Attributes Set by Employers
Performance Measure
Type of Rewards
Standard Level
Organizational Climate
Selected Employment Contract
Performance Measurement
Rewards

Self-Selection Effects

In Figure 1, a distinction is made between a worker's personal attributes and perceptions of them. Generally, only a worker's perceptions of personal attributes are involved directly in the contract selection process, and these perceptions may be vague or wrong. For example, an inexperienced worker in the labor market may have only vague perceptions about his/her skills before selecting a contract, such that he/she cannot predict exactly whether his/her performance will meet or exceed a standard, given some effort level, even in the absence of state uncertainty. Similarly, a distinction is made between employment contract attributes and a worker's perceptions of them. Again, only a worker's perceptions of contract attributes are directly involved in the contract selection process, and these perceptions may be vague or wrong. For example, a worker may base his or her contract selection on the erroneous perception that performance will be measured unidimensionally and accurately in a particular organization, only to learn through on-the-job experience that performance is measured on several (implicit as well as explicit) dimensions and with varying levels of accuracy. Alternatively, a worker may base his or her contract selection on the erroneous perception that the key attributes of an organization's employment contract (e.g., the standard level) will not change substantially during his/her tenure. Imprecise or inaccurate perceptions of personal or contract attributes may produce mismatches of workers and organizations, which are not apparent at the time of contract selection. Some turnover phenomena may be explicable in terms of the revelation of mismatches.

Given a set of perceptions, a worker's contract selection depends in part on an assessment of the relationship between various skill-effort combinations and performance (holding state factors constant for the moment), and between performance and rewards, for each available contract. Typically, it is expected that at a given skill level, higher effort leads to higher performance and in turn to higher rewards, and that at a given effort level, higher job-related skill leads to higher performance and rewards. Accordingly, self-perceived skill level and effort preferences are likely to play key roles in the process of selecting an employment contract. The analysis below focuses primarily on the relationship between a worker's pre-contracting performance capability and contract selection.[3]

Demski and Feltham [1978] analytically demonstrate that when skill is an important determinant of performance, standard-based contracts may vary in attractiveness to workers with different skill levels, holding effort preferences constant. Depending on the standard level and rewards for performance *vis-a-vis* standard, higher-skill workers may select a standard-based contract and lower-skill workers may select an alternative contract (e.g., a fixed pay contract). Chow [1983] provides empirical evidence which is consistent with this analytical result. As noted earlier, in Chow's experiment, subjects chose between a fixed pay and "bang-bang" contract. However, since a "bang-bang" contract may not be representative of contracts in actual use, a replication using an alternative form of contract is appropriate.

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[3] The concept of performance capability is introduced to facilitate empirical testing. Operationally, performance capability is defined as a subject's level of task performance on a pre-contracting trial. Note that the performance capability measure captures a skill-effort combination rather than skill *per se*. Measuring performance capability as defined is relatively straightforward, whereas measuring *separately* the contributions of skill and effort to performance is much more problematic. When testing for self-selection effects, the significance of using a measure of a worker's performance capability, rather than skill *per se*, depends on the nature of the task to be performed. From an organization's perspective, the underlying intent with respect to self-selection effects is to offer an employment contract that attracts workers whose task performance will be satisfactory. For tasks in which skill and effort inputs are largely compensatory (such as the task used in this study's experiment), the use of a measure of performance capability is appropriate in tests of self-selection effects. For tasks in which a high skill level is a necessary condition to satisfactory performance, a measure of skill *per se* may be required.

In this study's experiment, each subject selected a contract from an array of 11 contracts having the general form: $p=f+b(x-s)$ if $x>s$ or $p=f$ if $x\leq s$, where $p=$ a worker's total pay, $f=$ fixed pay, $b=$ a bonus parameter, $x=$ actual performance, and $s=$ standard level. Contracts in the array were varied in terms of performance incentives. At one extreme, f was maximal while $b=0$ (minimal performance incentives), and, at the other extreme, b was maximal while $f=0$ (maximal performance incentives). In the non-extreme contracts, b and f were varied simultaneously and inversely at values between 0 and the maximal. The following hypothesis was tested.

> H_1: There is a positive correlation between workers' performance capability and the performance incentives in the contracts they select.

Figure 1 indicates that a worker's performance may depend on noncontrollable state factors, as well as on skill and effort. Regarding performance measurement in such cases, a conventional prescription is to use a controllability filter that removes from measured performance the effects of state factors to avoid negative effort effects [Vroom, 1969; Ronen and Livingstone, 1975]. Recent analytical research has questioned the value of controllability filters, arguing that the inclusion of a controllability filter in an employment contract may be suboptimal because it precludes the benefits from risk sharing between workers and employers [Demski, 1976] and from indirect monitors of worker inputs [Holmstrom, 1982; Baiman and Demski, 1980].[4]

In cases where noncontrollable state factors affect performance and an offered employment contract has no controllability filter, the nature of a worker's risk preferences may affect his or her contract selection. This result is shown in the following example. Suppose that there are two types of workers, low performers and high performers, and each worker must select one of two alternative contracts, F and S. F pays \$45 regardless of performance. S pays \$100 if performance exceeds some standard and \$0 otherwise. After contract selection, each worker exerts either a low (e_1) or high (e_2) level of effort. A worker's performance capability and effort levels, along with the realized value of a state variable, determine performance.

For the moment, suppose S has no controllability filter. Because the value of the state variable is not known at the time of contract selection, workers cannot predict exactly whether their performance will exceed the standard in S. However, each worker can assess the probability of exceeding the standard, given effort level j, $P_i(x>s|e_j)$, where $i=1$ for low performers and $i=2$ for high performers. Suppose that $P_1(x>s|e_1)=0.2$, $P_1(x>e_2)$

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[4] Kaplan [1982, p. 612] questions the applicability of the analytical research results which attack the controllability principle on the grounds of suboptimal contracting with respect to risk sharing:

> The [risk sharing] example, however, is misleading because of its overly simplified context and its failure to capture the essence of interesting managerial situations. . . . Unless one believes that an important function for managers of firms is to share the risks of the owners or the central management group, then the reason for including noncontrollable random outcomes in the managers' incentive functions disappears. . . . In more realistic situations, where many more individuals are available in the economy, the decision-making and risk-sharing arrangements can be split among different economic agents. When these more realistic situations are modeled, we may not require the managers to share the risk of the owners or the central management group. Our problem will probably be the opposite one: how to shield the managers from the negative consequences of random outcomes from their own decisions.

$=0.3$, $P_2(x>s|e_1)=0.6$, and $P_2(x>s|e_2)=0.8$. Suppose that all workers have the same (separable) utility function for pay and effort, with disutilities for low and high effort levels of ten and 20 utiles, respectively. In this case, a worker's contract selection may depend on whether he/she is risk-neutral or risk-averse. Assuming first risk neutrality with $U(\$z)=z$, a high performer would select S and exert a high level of effort, while a low performer would select F and exert a low level of effort.[5] But, assuming risk aversion with $U(\$z)=(40z)^{1/2}$, all workers would select F and exert a low level of effort.[6]

Now suppose that S has a controllability filter. More specifically, suppose that the noncontrollable state variable has two possible values—state 1 and state 2— and that a flexible standard (i.e., a controllability filter) is employed such that the difference between the standard level given state 1 and the standard level given state 2 is equal to the differential effects on performance of state 1 vs. state 2. With the effects of the state variable thus removed, suppose that $P_1(x>s|e_1)=P_1(x>s|e_2)=P_2(x>s|e_1)=0.0$ and $P_2(x>s|e_2)=1.0$. In this case, risk preferences are irrelevant, and a high performer would select S and exert a high level of effort, while a low performer would select F and exert a low level of effort.[7]

The main point of this example is that, in the absence of a controllability filter, risk preferences as well as performance capability affect contract selection, whereas, in the presence of a controllability filter, risk preferences are irrelevant (or less relevant) and the relative effect of performance capability on contract selection increases.[8] If satisfactory task performance depends on a worker's performance capability rather than on his/her risk preferences (see footnote 4), then an employment contract with a controllability filter may be preferable from an organization's perspective to a contract without a controllability filter, because of the former's greater potential to distinguish workers with respect to performance capability based on their self-selections.[9] This analysis suggests the following hypothesis:

> H_2: Under the conditions of state uncertainty and worker risk aversion, the correlation between performance capability and performance incentives in the contract selected is higher in the presence of a controllability filter than in the absence of a controllability filter.

Another contract attribute that may affect the self-selection process is the standard level [Demski and Feltham, 1978]. Recall the earlier example in which $P_1(x>s|e_1)=0.2$, $P_1(x>s|e_2)=0.3$, $P_2(x>s|e_1)=0.6$, $P_2(x>s|e_2)=0.8$, a (risk-neutral) low performer selects F and a (risk-neutral) high performer selects S. In this case, the workers are distinguished with respect to performance capability through self-selection. However, if the standard level is increased such that $P_1(x>s|e_1)=0.1$, $P_1(x>s|e_2)=0.2$, $P_2(x>s|e_1)=0.3$, and $P_2(x>s|e_2)=0.5$, *ceteris paribus*, then both high and low performers would select F and exert a low level of effort.[10] It also could be shown that, if the standard level is decreased sufficiently, then all workers would select S. In either case, the workers are not distinguished through self-selection. For optimal self-selection effects, it would appear to be necessary for organizations to offer contracts with moderate standard levels.

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[5] For a high performer, $E(U|S,e_2)=60>E(U|S,e_1)=50>E(U|F,e_1)=35>E(U|F,e_2)=25$. For a low performer, $E(U|F,e_1)=35>E(U|F,e_2)=25>E(U|S,e_1)=E(U|S,e_2)=10$.

[6] For a high performer, $E(U|F,e_1)=32>E(U|S,e_2)=31>E(U|S,e_1)=28>E(U|F,e_2)=22$. For a low performer, $E(U|F,e_1)=32>E(U|F,e_2)=22>E(U|S,e_1)=3>E(U|S,e_2)=-1$.

[7] For a high performer, assuming $U(\$z)=z, E(U|S,e_2)=80>E(U|F,e_1)=35>E(U|F,e_2)=25>E(U|S,e_1)=-10$; the same ordering holds assuming $U(\$z)=(40z)^{1/2}$. For a low performer, assuming $U(\$z)=z$, $E(U|F,e_1)=35>E(U|F,e_2)=25>E(U|S,e_1)=-10>E(U|S,e_2)=-20$; the same ordering holds assuming $U(\$z)=(40z)^{1/2}$.

[8] Strictly speaking, in the presence of a controllability filter, risk preferences are irrelevant only if a worker has no uncertainty about performance given effort. A controllability filter may only reduce, and not eliminate, the effects of risk preferences on contract selection.

[9] Countering the beneficial self-selection effects of controllability filters are possible costs in terms of information requirements in performance measurement and less effective indirect monitoring.

Note, however, that the *ceteris paribus* assumption in the above example is not tenable—it is more reasonable to expect that, as the standard level changes, the bonus parameter will change [Demski and Feltham, 1978]. Nevertheless, assuming risk aversion, even when the bonus parameter is adjusted such that expected pay is constant over contracts with different standard levels, the distinguishability of workers based on their self-selections may depend on the standard level. Consider two labor markets. In market 1, contracts F (where pay, p, equals \$45 regardless of performance) and S (where p equals \$100 if $x>s$ and \$0 otherwise) are offered. In market 2, contracts F and S' (where p equals \$200 if $x>s$ and \$0 otherwise) are offered. Suppose that the standard level is higher in S' than in S such that, for high performers, $P_2(x>s|S,e_1)=0.70$, $P_2(x>s|S,e_2)=0.90$, $P_2(x>s|S',e_1)=0.35$, $P_2(x>s|S',e_2)=0.45$; thus, $E(p|S,e_1)=E(p|S',e_1)=\$70$ and $E(p|S,e_2)=E(p|S',e_2)=\$90$. Suppose that, for a low performer, F is always preferable. For a high performer with $U(\$z)=z$, S is preferred to F in market 1 and S' is preferred to F in market 2.[11] For a high performer with $U(\$z)=(40z)^{1/2}$, S is preferred to F in market 1 but F is preferred to S' in market 2.[12] In market 1, the workers are distinguished with respect to performance capability based on their self-selections, while in market 2, because of the higher standard level and risk aversion, they are not so distinguished. This example indicates that, assuming the workers are risk-averse, increasing the standard from, say, a moderate level to a high level may weaken the distinguishability of low and high performers through self-selection, unless changes in expected pay compensate the high performers for the greater risk.

> H_3: Under the condition of worker risk aversion, the correlation between performance capability and performance incentives in the contract selected is higher at a moderate standard level than at a high standard level.

Interdependence of Self-Selection and Effort Effects

As noted earlier, previous empirical studies have focused almost exclusively on the effort effects of standard-based employment contracts in *given* employment settings, with little or no consideration of self-selection effects. The present framework suggests that such an approach is incomplete. In the examples presented earlier, conclusions were reached such as the following: A low performer would select F *and* exert a low level of effort, while a high performer would select *S and* exert a high level of effort. Note that each performer commits himself or herself simultaneously to a reward system *and* the effort level induced by that reward system. The implication is that the self-selection and effort effects of standard-based contracts are inextricably linked. In the absence of post-contracting changes in worker or contract attributes, or in a worker's perceptions of them, the effort effects of standard-based contracts are determined at the time of contract selection, even though they are not realized until the worker performs on the job. To explain the effort effects of standard-based contracts requires an explanation of the contract selection process. Further, an adequate explanation of the contract selection process may be sufficient to explain the effort effects of standard-based contracts.

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[10] For a high performer, $E(U|F,e_1)=35>E(U|S,e_2)=30>E(U|F,e_2)=25>E(U|S,e_1)=20$. For a low performer, $E(U|F,e_1)=35>E(U|F,e_2)=25>E(U|S,e_1)=E(U|S,e_2)=0$.

[11] In market 1, $E(U|S,e_2)=70>E(U|S,e_1)=60>E(U|F,e_1)=35>E(U|F,e_2)=25$. In market 2, $E(U|S',e_2)=70>E(U|S',e_1)=60>E(U|F,e_1)=35>E(U|F,e_2)=25$.

[12] In market 1, $E(U|S,e_2)=37>E(U|S,e_1)=34>E(U|F,e_1)=32>E(U|F,e_2)=22$. In market 2, $E(U|F,e_1)=32>E(U|F,e_2)=22>E(U|S',e_1)=21>E(U|S',e_2)=20$.

Although this assertion cannot be tested directly in the experiment reported below because direct measures of the subjects' effort levels were not obtained, an indirect test is possible. Figure 1 represents the effort effects of employment contracts by the contract-effort-performance linkage. Note that these effort effects are distinct from the *direct* effects of skill on performance. The following hypothesis predicts the specific nature of these effort effects.

H_{4a}: The performance of workers who select contracts with high performance incentives is higher than the performance of workers who select contracts with low performance incentives.

Results which are consistent with H_{4a} would indicate the presence of effort effects. If in fact contract selection can explain effort effects, then there should be no residual effort effects after controlling for the factors that explain contract selection. More specifically, assuming that H_1 holds such that the type of contract selected can be explained in terms of a worker's pre-contracting performance capability, two results occur when this factor is controlled for. First, any *direct* effects of pre-contracting performance capability on performance are removed; again, such effects are distinct from the effort effects of contracts. Second, the *indirect* effects of pre-contracting performance capability on performance via the contract-effort-performance linkage are removed. Once the latter effects are removed, it follows from the assertion that contract selection can explain effort effects that there will be no residual effects on performance due to the type of contract selected. This analysis suggests the following hypothesis:

H_{4b}: Controlling for workers' performance capability, the performance of workers who select contracts with high performance incentives is not different from the performance of workers who select contracts with low performance incentives.

Results which are jointly consistent with H_1, H_{4a}, and H_{4b} would support the assertion that contract selection can explain effort effects.

METHOD

Overview

A laboratory experiment was performed to test the hypotheses stated above. The subjects were 63 students enrolled in an upper-level cost accounting course. The experimental task was adapted from Rockness [1977] and Chow [1983]. It involved decoding randomly sequenced letters (alphabetic characters) which had been punched on computer cards with the printing suppressed. Each subject selected an employment contract from an

FIGURE 2
EXPERIMENTAL DESIGN

		No State Uncertainty	*State Uncertainty*
No Controllability Filter	Moderate Standard	$n=11$	$n=10$
	High Standard	$n=10$	$n=10$
Controllability Filter	Moderate Standard		$n=10$
	High Standard		$n=10$

array of 11 alternatives, after receiving feedback on his or her performance capability level on a pre-test. The task was repeated, and each subject received a cash payment based on actual performance and the contract selected.

The subjects were assigned randomly to the six experimental groups shown in Figure 2. The three independent variables were state uncertainty (no/yes), a controllability filter (no/yes), and standard level (moderate/high). However, the two cells which couple no state uncertainty with the presence of a controllability filter were omitted, because controllability filters are not relevant when there is no state uncertainty.

Administration of Experiment

There were two sessions in the administration of the experiment: the pre-test session and the experimental session.

Pre-test Session. This session was used to obtain measures of the subjects' performance capability levels. The decoding task was explained by the experimenter, followed by a four-minute practice period with feedback on the number of letters correctly decoded. When the subjects indicated that they understood the task instructions, they were told to decode as many letters as possible in a 15-minute period. At the end of this period, the subjects turned in all materials. The subjects were not paid for their performance in this session, though performing in the pre-session was a necessary condition for receiving a cash payment in the experimental session.

Experimental Session. The experimental session took place about a week after the pre-test session. After going over the general instructions in a questionnaire (see Appendix), each subject received feedback on the number of letters he or she had decoded correctly during the 15-minute period in the pre-test session. Each subject also was given information on the performance for the entire group of subjects.

Next, the experimental treatments were introduced. The subjects in the No State Uncertainty groups were informed that each card to be decoded contained ten letters. The State Uncertainty groups were informed that the average number of letters per card was ten, but that the actual number per card varied in the following proportions: four letters, 1/15; six letters, 2/15; eight letters, 2/15; ten letters, 5/15; 12 letters, 2/15; 14 letters, 2/15; and 16 letters, 1/15. The subjects assigned to the Controllability Filter groups were informed that their performance would be measured in terms of *letters* decoded correctly. The subjects assigned to the No Controllability Filter groups were told that their performance would be measured in terms of *cards* decoded correctly. Thus, measured performance for the Controllability Filter groups would be affected minimally by the actual number of letters punched on any particular card (the realization of a noncontrollable state variable). However, measured performance for the No Controllability Filter groups could be affected significantly by the number of letters punched on the cards actually decoded.

Each subject was assigned either the moderate or high standard level. The moderate (high) standard was set at 110 (150) letters for the subjects in the Controllability Filter groups.[13] The moderate (high) standard was set at 11 (15) cards for the subjects in the No Controllability Filter groups. The transformation from the standard in terms of letters to the standard in terms of cards was based on the average number (ten) of letters per card.

Next, each subject was asked to select from an array of 11 employment contracts the one that would determine his or her pay. The array of contracts for the Moderate Standard—No Controllability Filter groups is shown in the Appendix. The values of f and b were varied simultaneously and inversely, ranging from $f=\$3.00$ and $b=\$0.00$ in Pay Schedule A to $f=\$0.00$ and $b=\$1.80$ in Pay Schedule K. Contract to contract, there was a \$0.30 decrease in f and a \$0.18 increase in b. The \$0.18 increase was determined in the following manner. Let $m=$ the expected amount of bonus pay, and $q_x=$ the probability of achieving x. Thus, $m=\Sigma b(x-s)q_x=b\Sigma(x-s)q_x$, and $b=m/\Sigma(x-s)q_x$. When $m=\$0.30$, $s=11$, and the distribution for x is $N(11,3.7)$, $b=\$0.18$.[14] For the other experimental groups, the increase in b was computed in a similar way, taking into account changes in s and the performance measure (letters or cards). The f values in the array were the same for all experimental groups.

After their contract selections, the subjects were given 15 minutes to perform the decoding task for pay under their selected contracts. The subjects were paid at a later meeting.

Measures

The subjects' pre-contracting performance capability levels were measured by the number of correctly decoded letters during the pre-test session. The array of contracts formed an 11-value ordinally-scaled variable, ranging from a contract with minimal performance incentives to a contract with maximal performance incentives. The subjects' contract selections determined their values for this variable. The subjects' performance levels were measured by the number of correctly decoded letters during the experimental sessions.

RESULTS

Two subjects were excluded because of

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[13] The distribution of performance capability levels from the pre-test session had a mean of 110 letters and a standard deviation of 37 letters. A Kolmogorov-Smirnov test indicated no significant departure from normality ($z=0.57, p=0.90$). The moderate standard level in terms of letters was set at the mean of this distribution (110 letters) and the high standard level was set at the 0.86 percentile (150 letters).

[14] This procedure results in expected total pay remaining constant at \$3.00 over contracts for an "average" subject whose performance in terms of cards in the long-run conforms to $N(11,3.7)$. Clearly, expected total pay did not remain constant over contracts *for each subject* (if it had remained constant, self-selection effects relating to performance capability would have been suppressed). It is likely that, for better (worse) than average performers, expected total pay increased (decreased) from Pay Schedule A to Pay Schedule K.

TABLE 1

CONTRACT SELECTIONS AND MEDIAN PERFORMANCE CAPABILITY AND PERFORMANCE

PANEL A:

Overall			
C	*N*	*PC*	*PF*
A	18	102	118
B	7	110	139
C	8	112	154
D	5	116	141
E	1	128	119
F	2	93	106
G	3	102	146
H	1	94	129
I	0	—	—
J	0	—	—
K	16	138	163
	61	110	136

PANEL B:

No Controllability Filter/State Uncertainty				*Controllability Filter/State Uncertainty*			
C	*N*	*PC*	*PF*	*C*	*N*	*PC*	*PF*
A	8	110	125	A	5	89	119
B–J	8	116	139	B–J	7	110	116
K	4	122	158	K	8	134	169
	20	113	135		20	112	133

PANEL C:

Moderate Standard				*High Standard*			
C	*N*	*PC*	*PF*	*C*	*N*	*PC*	*PF*
A	8	104	125	A	10	93	114
B–J	14	110	132	B–J	13	107	139
K	9	136	168	K	7	140	163
	31	110	133		30	110	138

Legend:
C—Contract Selected
N—Number of Subjects
PC—Performance Capability
PF—Performance

incomplete data, leaving 61 subjects' responses for the data analyses. Panel A of Table 1 presents descriptive statistics on the subjects' contract selections, performance capability levels, and performance levels.

Self-Selection Effects

H_1 predicts that there is a positive correlation between workers' performance capability and the performance incentives in the contracts they select. To test this hypothesis, Spearman's rho (r_s) was computed for the subjects' performance capability levels and the performance incentives in the contract selected. The value of r_s was 0.53 ($p=0.001$, $n=61$). Panel A in Table 1 indicates that this result is largely attributable to the tendency for low performers to select contracts with minimal performance incentives and high performers to select contracts with maximal performance incentives. Although this result is consistent with H_1, it should be noted that it does not hold uniformly over all experimental groups (see below).

H_2 predicts that, under the conditions of state uncertainty and worker risk aversion, the correlation between performance capability and performance incentives in the contract selected is higher in the presence of a controllability filter than in the absence of a controllability filter.[15] To test this hypothesis, two values of r_2 were computed between performance capability and performance incentives in the contract selected for the (1) State Uncertainty—No Controllability Filter group ($n=20$) and (2) State Uncertainty—Controllability Filter group ($n=20$). The value of r_s was 0.16 ($p=0.25$) for the former group and 0.62 ($p=0.002$) for the latter group. The latter value of r_s is significantly greater than the former ($z=1.65$, one-tail $p<0.05$), using a test described by Lindeman, Merenda and Gold [1980, pp. 51–52]. Panel B in Table 1 indicates that the type of contract selected produced a greater separation of the subjects in terms of performance capability in the presence of a controllability filter. This result is consistent with H_2.[16]

H_3 predicts that, under the condition of worker risk aversion, the correlation between performance capability and performance incentives in the contract selected is higher at a moderate standard level than at a high standard level. To test this hypothesis, two value of r_s were computed between performance capability and performance incentives in the contract selected for the (1) Moderate Standard group ($n=31$) and (2) High Standard group ($n=30$). The value of r_s was 0.51 ($p=0.001$) for the former group and 0.55 ($p=0.001$) for the latter group. These values of r_s do not differ significantly ($z=0.21$, $p>0.40$). Panel C in Table 1 indicates that the separation of subjects in terms of performance capability by the type of contract selected was about the same at the moderate and high standard levels. This result is not consistent with H_3.[17]

Interdependence of Self-Selection and Effort Effects

H_{4a} predicts that the performance of workers who select contracts with high performance incentives is higher than the performance of workers who select contracts with low performance incentives. To test this hypothesis, a one-way analysis of variance was performed using the subjects' performance levels as the dependent measure and their contract selections as the factor. For purposes of this test, the subjects' contract selections were put into three groups: 18 selections of a strictly fixed pay contract, 27 selections of a mixed pay contract, and 16 selections of a strictly bonus pay contract. The type of contract selected had a significant effect on performance ($F[2,60]=13.1$, $p=0.001$).[18] Mean performance was 112 for the strictly fixed pay group, 130 for the mixed pay group, and 166 for the strictly bonus pay group. These results are consistent with H_{4a}.

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[15] H_2 and H_3 assume the condition of worker risk aversion. To substantiate this assumption, subjects were asked to respond to a questionnaire item, distinct from the main experimental task, which involved a trade-off between "dividend schedules" with different variances for payoffs holding the mean payoff constant. Their responses showed overwhelmingly that they were risk-averse. However, it should be noted that this measure of risk preferences is subject to limitations similar to those of measures used in previous research (see Hershey, Kunreuther and Schoemaker [1982]).

[16] The value of r_s for the State Uncertainty—Controllability Filter group was about the same as the value of r_s for the 21 subjects in the No State Uncertainty group ($r_s=0.68$, $p=0.001$).

[17] All subjects' responses, rather than only those of the State Uncertainty groups, were included in the test of H_3 because uncertainty about performance may be present even in the absence of state uncertainty.

H_{4b} predicts that, controlling for workers' performance capability, the performance of workers who select contracts with high performance incentives is not different from the performance of workers who select contracts with low performance incentives. To test this hypothesis, the analysis of variance described above was repeated, except that the subjects' performance capability levels were included as a covariate. Performance capability and performance were highly correlated ($r_s=0.81, p=0.001$). In the analysis of variance, after controlling for the subjects' performance capability levels, the type of contract did not have a significant effect on performance ($F[2,60] = 1.46, p>0.24$). This result is consistent with H_{4b}.

SUMMARY AND DISCUSSION

This paper has presented a framework for empirical research on the self-selection and effort effects of standard-based employment contracts on performance, along with the results of an experiment that tests some hypotheses derived within the framework. The essence of the framework is that, to understand how standard-based employment contracts affect worker performance, it is necessary to examine how personal and contract attributes (or a worker's perceptions of them) affect the self-selection process and how self-selection and effort are interdependent.

The experiment examined the correlation between performance capability and performance incentives in the contract selected, how this correlation is influenced by a controllability filter and the standard level, and the interdependence of self-selection and effort effects. The results were consistent with the hypothesis that workers select among alternative employment contracts based on their performance capability. Subjects with higher (lower) performance capability levels tended to select contracts with higher (lower) performance incentives. This general pattern of self-selection appears to hold regardless of whether the standard-based contract is a "bang-bang" contract [Chow, 1983] or a fixed pay plus bonus per unit of performance over standard contract. The results also supported the hypothesis that the correlation between performance capability and performance incentives in the contract selected is higher in the presence of a controllability filter, presumably because of the reduced role of risk aversion. From a contract design perspective, the implication is that offering standard-based contracts which incorporate controllability filters may facilitate the attraction of better performers to an organization.

The results were not consistent with the hypothesis that the correlation between performance capability and performance incentives in the contract selected is higher at a moderate as opposed to high standard level. One explanation is that the spread between the standard levels was not wide enough. Learning may have occurred during the pre-test session such that the "high" standard (e.g., 150 letters) was not difficult enough for high performers to induce them to prefer low *b*/high *f* contracts over high *b*/low *f* contracts. Another explanation is that the subjects did not put much emphasis on the standard levels. Perhaps the only essential features of the available contracts were the extent to which rewards were based on performance and whether noncontrollable state factors affected measured performance. The necessity of standards for beneficial self-selection and effort effects is not indicated by this study's results. Future research should pursue both explanations.

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[18] Another analysis of variance which controlled for effects of the standard level, state uncertainty, and controllability filter independent variables yielded a similar result.

The results were consistent with the assertion that contract selection can explain the effort effects of employment contracts. The subjects' performance tended to increase (decrease) with contracts having higher (lower) performance incentives. This result indicated the presence of significant effort effects on performance due to the type of contract. However, these effort effects were no longer significant when the subjects' pre-contracting performance capability (a key factor in the contract selection process) was controlled for. Future research might attempt to replicate this finding using a more direct test of the interdependence between self-selection and effort.

A number of caveats about the experiment and framework should be noted. First, although pre-contracting performance capability was a key factor in the contract selection process, accounting for approximately 30 percent of the variance in the subjects' contract selection, other factors also must have been influential. For example, an examination of Panel A of Table 1 indicates that performance capability is not a good indicator of contract selection for the mixed contracts. Future research might attempt to produce more complete explanations of contract selection by collecting measures of personal attributes in addition to performance capability. Specifically, future research might use measures that attempt to unconfound the effects of skill and effort preferences on self-selection. Refined measures of risk preferences also are needed.

Second, employment contracting between workers and organizations is a market phenomenon, and the experiment examined only one side of the market. A natural extension would be to create an experimental labor market in which both contract design and contract selection can be examined. With respect to method, the experimental economics literature may be of some aid [Smith, 1982; Plott, 1982].

Third, in developing the hypotheses tested in the experiment, it was assumed implicitly that a worker has perfect knowledge about the alternative contracts' attributes. Future research might examine the effects of ambiguity about contract attributes (e.g., an uncertain participatory process for standard-setting or an imperfect controllability filter). Also, it was assumed that the subjects' perceptions about their performance capability were largely based on the feedback they received from the pre-test session. The extent to which the subjects' uncertainty about their performance, holding effort and state constant, affected their contract selections was not assessed.

Fourth, in stating the assertion that contract selection can explain effort effects, it was assumed that there would be no post-contracting changes in worker or contract attributes. Future research might examine, in a multi-period context, the effects of post-contracting resolutions of ambiguities and changes in worker or contract attributes. The possibility of employee turnover may be introduced in the multi-period context.

Perhaps the most important implication for future research is that questions concerning the effects of standard-based employment contracts on worker performance and the role of related accounting variables should be recast. Instead of asking "Do reasonably attainable standards produce better performance than easy or hard standards?", it is more appropriate to ask "Are reasonably attainable standards more effective in attracting to the organization and retaining workers who have high skill levels and/or a willingness to commit themselves to high effort levels than easy or hard standards?" Instead of asking "Will tighter standards improve worker motivation?", it is more appropriate to ask "How will tighter standards affect the sort of workers who are attracted to the organization and the effort levels to which they pre-commit, as well as the effort levels and performance of workers who were attracted to the organization in the past by contracts with looser standards?" An organization's control problems concerning worker performance generally start, and perhaps generally can be stopped, at its front door.

APPENDIX

You are asked to perform the same decoding task that you did last week. You will be given a deck of 60 cards on which alphabetic characters or letters have been punched in "machine-readable" form. The letters have not been printed in "human-readable" form at the top of the cards. Your task will be to decode the letters by translating the machine-readable form into human-readable form (that is, into the form of A, B, D, . . . , Z).

There are a few differences between the conditions for last week's task and today's task. One difference is that *you will be paid real money for your performance* on the task today. The exact amount that you will be paid depends on two things: (1) your performance relative to a standard of performance and (2) the pay schedule that *you select* from among a set of 11 alternative pay schedules. The set of 11 alternative pay schedules is presented later. Other differences are explained below.

The specific procedure for today will be as follows:

(1) You will be given your PERFORMANCE DECK of 60 cards, a DECODING KEY to help you do the task, and an ANSWER SHEET to record your decodings.
(2) Before you perform the decoding task, you will be given ten minutes to read over this pamphlet and decide under which of the 11 alternative pay schedules you prefer to work.
(3) When ten minutes have elapsed, I will tell you to get ready to begin the decoding task.
(4) You will be given exactly fifteen (15) minutes to do as much decoding as possible. In order to be paid, you must proceed through the deck of cards in the exact order in which they were given to you.
(5) When exactly fifteen (15) minutes have elapsed, I will tell you to stop. At that time, I will ask you to assemble all of the cards in your PERFORMANCE DECK, put the rubber band around them, write your name on the top card of the deck, and then turn in your PERFORMANCE DECK and your ANSWER SHEET.

Between today and the day of your final exam, I will determine how well each of you performed on the decoding task. Based on your performance and the pay schedule that you select, I will compute the exact amount of money that each of you has earned. You will be paid this amount on the day of your final exam.

Now, take up to ten minutes to read over this pamphlet and select the pay schedule under which you prefer to work.

I would like you to know how well you performed in last week's task relative to everyone else.

(a) On your ANSWER SHEET, you tried to decode ________ letters.
(b) Of that number, you decoded ________ letters correctly.
(c) For the entire group who performed the task, *average* performance was the correct decoding of 110 letters. The standard deviation was 37 letters.

The following information pertains to today's task. Your new PERFORMANCE DECK has the following characteristics:

(a) The *average* number of letters to be decoded per card equals ten.
(b) There is a degree of variability among the cards in your PERFORMANCE DECK with respect to the number of letters to be decoded on each card. Specifically, there is a

1/15 chance that the card has 4 letters to decode,
2/15 chance that the card has 6 letters to decode,
2/15 chance that the card has 8 letters to decode,
5/15 chance that the card has 10 letters to decode,
2/15 chance that the card has 12 letters to decode,
2/15 chance that the card has 14 letters to decode, and
1/15 chance that the card has 16 letters to decode.

Examine carefully the set of 11 alternative pay schedules below. Each pay schedule pays (a) a fixed amount plus (b) a bonus for every *card* that you decode correctly over and above the standard of performance. The standard of performance is 11 *cards* decoded correctly.

Pay Schedule	*Fixed Amount*	*Bonus for Every Card Decoded Correctly over Standard*
A	$3.00	$0.00
B	2.70	0.18
C	2.40	0.36
D	2.10	0.54
E	1.80	0.72
F	1.50	0.90
G	1.20	1.08
H	0.90	1.26
I	0.60	1.44
J	0.30	1.62
K	0.00	1.80

Under which pay schedule do you prefer to work? Indicate your selection by putting the letter of the pay schedule that you selected in the space to the right. ____________

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NOTES

An Examination of Auditor Performance Evaluation

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ABSTRACT: Decisions about a subordinate's behavior are among the most important control problems facing audit managers and partners. Green and Mitchell [1979] apply attribution theory to examine supervisors' decisions made following a subordinate's behavior. Green and Mitchell argue that an individual's causal attributions regarding a subordinate's behavior serve as mediators between the behavior of the subordinate and the action responses of the evaluator.

This paper reports the results of a study that examines the attribution judgments and responses made by auditors following an incidence of an audit senior's poor performance. Employee work history and client history each significantly affect the attribution judgments made by auditors. Also, the attribution judgments were associated significantly with the recommended responses of auditors. Additional analyses showed that the association was higher for internal attributions and responses than for external attributions and responses.

DECISIONS about a subordinate's behavior are among the most important control problems facing audit management because performance evaluation serves as a basis for scheduling, pay increases, promotions, demotions, and continued employment. The performance evaluation of a subordinate who has performed poorly is particularly problematic. A supervisor must evaluate the subordinate's performance given a complex operating environment in which clients, tasks, and audit teams are continually changing, any one of which might have caused the substandard performance. Only recently have performance appraisal researchers empirically studied employees who have performed poorly (see Mitchell, Green and Wood [1981] for a review). However, the process by which a poorly performing auditor is evaluated has not been addressed empirically. Differences in the audit task from most other work settings suggest a need to examine separately the evaluation process in the audit setting. For example, audit clients as well as audit teams frequently change, which is not common in most work settings. Also, the attributional processes of auditors have been observed elsewhere to follow distinctive patterns [Arrington, Bailey and Hopwood, 1985], possibly due to differing experiences and professional demands. The objective of this paper is to

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provide evidence on factors which influence the performance evaluation of auditors. A better understanding of the evaluation process may lead to improvements in the process.

This paper examines the attribution judgments and responses made by auditors following an incidence of an audit senior's poor performance. Employee work history and client history are manipulated independent variables. Audit seniors and audit managers served as subjects. Audit seniors represent a peer group to a poorly performing audit senior, whereas audit managers represent a supervisory group.

The application of attribution theory to organizational settings and performance evaluations is encouraged strongly by the work of Green and Mitchell [1979] and is reviewed by Cummings [1982]. Green and Mitchell argue quite succinctly that an evaluator's causal attributions serve as mediators between the "substandard" behavior of the subordinate and a supervisor's response. A model of performance evaluation based upon attribution theory is developed and the hypotheses to be tested are discussed in the next section.

ATTRIBUTION THEORY

Attribution theory is concerned with how people make causal explanations. An attribution refers to the process of inferring certain dispositional properties to various entities in the environment [Kelley, 1967]. Attribution theory is based on the assumption that individuals rationally interpret and analyze events in order to achieve an understanding of the causal structure of their environment [Kelley, 1973]. They seek informational cues about what has happened and why it has happened and make an attribution of the cause of an event which in turn affects the response. Attribution theory is most applicable in situations in which causality is uncertain. Performance evaluation of a poorly performing auditor is such a situation because frequently it is not possible to ascertain perfectly the causes of poor performance.

A model of the attributional processes in an organizational setting is proposed by Green and Mitchell [1979]. Subordinate performance is the stimulus event. According to attribution theory, the process of ascribing cause to an event is based upon the conditions varying with the occurrence of the event (covariation principle) [Kelley and Michela, 1980]. Attribution theory further identifies three classes of information over which events covary: distinctiveness information, consistency information, and consensus information [Kelley, 1967]. Information is high in distinctiveness when the subordinate's current performance is significantly different from his performance on other types of tasks. Information is high in consistency when the subordinate's current performance is not different from his performance on similar tasks at other times. Information is high in consensus when the subordinate's current performance is not significantly different from the performance of other subordinates on this task.

Someone evaluating performance decides if an event is caused by the person engaging in the event (i.e., the audit senior) or is due to situational factors. An attribution to the person is considered an internal attribution, whereas an attribution to the situation is considered an external attribution. Research has shown that individuals' attribution judgments generally are consistent with the covariation principle (see Kelley and Michela [1980] for a review). Feldman [1981] provides a discussion of factors which tend to moderate this general attribution process.

Mitchell and Wood [1980] manipulated distinctiveness, consistency, and consensus information to form a work history treatment. A poorly performing subordinate nurse was described as having either a good or bad work history. The attributions of nursing supervisors were affected systematically by the work history treatment. When the poorly performing nurse had a good work history, a relatively stronger external attribution was made by nursing supervisors. Relatively stronger internal attributions were made when the subordinate nurse had a poor work history. Our study manipulated work history in a similar manner, but in a different setting with a different class of respondents. The environment of public accounting is so different from the nursing environment that untested generalization is inappropriate. This leads to our first hypothesis.

H_1: Internal attributions will be greater under conditions of poor subordinate work history than under conditions of good subordinate work history in an audit context.

The context in which decisions are made is also important to attributions. Einhorn and Hogarth [1983] provide the following example: Imagine that a watch face has been struck sharply by a hammer and the glass breaks. Given only this information, the force of the hammer is judged as the most likely cause of the breakage. However, imagine that you were also told that the context was a watch factory where a hammer strikes watch faces as part of a testing procedure. In this case a defect in the glass is judged the most likely cause of the breakage.

The audit client represents a primary aspect of the causal background in our study. No parallel exists in the Mitchell and Wood [1980] study, but two arguments suggest that the auditors' attributions for poor performance would be affected by the stability of the audit client. First, Einhorn and Hogarth [1983] argue that information will be ascribed greater importance if it is unexpected given some causal background. In auditing, under conditions where a client is stable, the authors would expect poor performance to appear more deviant than under conditions where the environment included an unstable client. Second, Einhorn and Hogarth [1983] illustrate that the importance ascribed to information is related to the number of alternative explanations. The number of alternative explanations for the poor performance should be greater in an unstable client condition. Consistent with this position, client stability is expected to affect the attributions made by auditors.

H_2: Internal attributions will be greater under conditions of a stable client history than under conditions of an unstable client history.

The individual's perspective when making an attribution also influences judgments [Jones, 1979]. One of the most consistently reported attributional phenomena has been the tendency for actors of behavior to arrive at relatively more external and less internal attributions than do observers of behaviors (see Watson [1982] for a review). Perspective effects also have been reported between different types of observers. Arrington, Bailey and Hopwood [1985] report that auditors and business owners reached different attributions concerning the performance of auditors. The affective relationship between an actor and observer also can influence attributions. Mitchell and Liden [1982] and Regan, Straus and Fazio [1974] found that observers made stronger external attributions when a high affective relationship existed with the actor.

Audit managers (superiors) may have a

different relationship to a poorly performing audit senior than do other audit seniors (peers). Peers have current knowledge of the demands placed on a senior in the conduct of his job and may be more familiar with the external factors which may influence performance. Superiors perform in a different role and possess different amounts and types of audit experience. Research in the area of performance ratings has found differences in the judgments made by peers and superiors [Borman, 1974; Gordan and Medland, 1965; Rothaus, Morton and Hanson, 1965; Springer, 1953; and Zedeck, et al., 1974]. Thus, these two groups may have different perspectives, which may result in different attributions. A peer might make judgments more similar to those of the incumbent employee than to those of a supervisor. This leads to our third hypothesis.

H_3: Internal attributions will be greater by subjects of manager rank than by subjects of senior rank.

Green and Mitchell [1979] postulate that an evaluator's action-responses are directly related to his/her causal attributions. That is, an internal attribution would be followed by a response directed towards the subordinate whereas an external attribution would be followed by a response directed towards the environment. This leads to our fourth hypothesis.

H_4: Action-responses of auditors will be positively associated with causal attributions.

METHOD

An experiment was conducted using practicing auditors assigned an evaluation task. The subjects, task, independent variables, and dependent variables are described below.

Subjects

The subjects of the experiment were practicing CPAs from the Phoenix, Arizona offices of each of the "Big Eight" public accounting firms. The authors sought the assistance of eight subjects from each office, four audit seniors and four audit managers. The research was executed with complete subject anonymity. Selection of audit subjects was made by a liaison officer with each firm. Questionnaire packets were delivered to the liaison officer, who was responsible for the distribution and subsequent collection of the sealed instruments. Of the eight firms, six provided the requested eight subjects, one provided seven, and one provided five. Of the 60 respondents, 31 were audit seniors and 29 were audit managers. All respondents held CPA certification and were experienced auditors. Their average age was 28.5 years.

Task

Each subject was given two scenarios, each followed by a series of questions. The scenarios described an audit senior exceeding an audit time budget (actual time was 160 percent of budget) and failing to meet the client-imposed deadline. Each scenario included selected background information about the audit senior and the audit client (see section on independent variables below). Time budget and deadline failure were selected as the audit failure because they have been found to influence performance appraisal judgments [Wright, 1980]. For each of the two scenarios, subjects made causal attributions and indicated an expected action-reponse. An example of a scenario is shown in Figure 1. This figure also includes the eight attribution scales employed.

Independent Variables

The experiment included three inde-

FIGURE 1

SAMPLE INSTRUMENT

The annual regulatory audit of First Continental Group, a Colorado banking corporation, has recently been conducted. Bill Mitchell was the on-site senior. Although Bill has had prior bank audit experience, he was new to the audit this year, as were two others of his staff of three. A clean opinion was rendered upon completion of the audit, but the job came in at 160 percent of budget. What's more, the report failed to meet the client's imposed deadline—the Board of Director's March 1 meeting. Neither event was anticipated, as the budget was felt to be reasonable. The client has expressed clear dissatisfaction with the failure of Mitchell and his staff to meet their deadline.

It is unusual for Bill to go this badly over budget and to fail to meet the client's deadline. He has consistently performed well on other jobs that he has seniored since his promotion to senior one year ago. Bill has also done a superior job on several special project tasks within the office to which he has been assigned. Other seniors on bank audits, in the past, have also experienced difficulty meeting deadlines and/or staying within budget.

First Continental Group is an old client of the auditing firm. It has exhibited relative stability in its operations over the last decade, and within the office has been considered a good assignment.

1. Please respond to each of the scales below. Regarding each, please indicate the extent to which you think the item contributed to the failures experienced on this engagement.

task difficulty
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

client's total
lack of cooperation
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

staffs' lack of effort
or ability
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

bad luck
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

senior's lack of effort
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

senior's lack of
leadership ability
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

senior's lack of
decision-making ability
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

senior's low
intrinsic motivation
0---------0---------0---------0---------0---------0---------0
very unlikely cause very likely cause

2. Please respond to each of the following questions.

To what extent do you feel the failures experienced on this engagement demand that you direct your responses at the senior and attempt to change something about him (his job attitude, level of effort, etc.)?

0---------0---------0---------0---------0---------0---------0
not at all to a great extent

To what extent would you want to change something about the situation (work performed by client, scheduling of staff, etc.)?

0---------0---------0---------0---------0---------0---------0
not at all to a great extent

pendent variables, two manipulated within the scenario (work history and client history) and one measured (evaluator professional rank).

Two levels of work history (good and poor) describing an audit senior were included in the study (see paragraph two of Figure 1). Work history was based upon distinctiveness, consistency, and consensus information. Under a good work history, an audit senior was described as having done well on other non-audit tasks in the past and done well on this type of audit task in the past. Other audit seniors also were said to have had difficulty with the task upon which the senior had currently "failed" (i.e., high distinctiveness, low consistency, and high consensus). Under a poor work history these statements were reversed.

Work history was a within-subject variable for two reasons. First, the availability of practicing auditors, especially managers, was limited. Second, these specific patterns of consistency, distinctiveness, and consensus information have been used elsewhere in other contexts and tend to evoke consistent attributions when treated as either a within-subject or between-subject variable [McArthur, 1972; Mitchell and Wood, 1980; Ruble and Feldman, 1976; Zuckerman, 1978].

Two levels of client history (stable and unstable) were included in the study. The client represents an important dimension of the causal background that an individual might use in attributing cause for an audit failure. A new and rapidly growing client is used to establish an "unstable" history whereas an old and slow-growing client is used to establish a "stable" history. Client history was a between-subject variable.

Two levels of rank (senior and manager) were examined in the study. Rank refers to the organizational position of the subject, i.e., audit senior or manager.

Dependent Variables

The dependent variables include (1) causal attributions and (2) action-responses. Four internal and four external attribution scales were used to assess causal attributions. This method of attribution measurement is common [Elig and Frieze, 1979]. The end points for the seven-point scales employed were "very likely cause" and "very unlikely cause." The four internal scales were: senior's effort, senior's leadership ability, senior's decision-making ability, and senior's intrinsic motivation. The four external scales were: task, client cooperation, staff, and luck. These scales were similar to Shields, Birnberg and Frieze [1981] but modified where necessary for the audit setting.

The sum of the four external scores was subtracted from the sum of the internal scores to provide a net (internal-external) attribution score. This net score indicates the relative importance of internal and external factors [Elig and Frieze, 1979].

To measure action-responses, subjects were asked to what extent their response would be directed at (1) the senior, and (2) the situation. The end points for these two questions were "not at all" and "to a great extent" (see Figure 1). Net response score was calculated by subtracting the situation response from the senior response.

RESULTS

Attributions

A three-factor analysis of variance (ANOVA) was conducted. Each factor had two levels and work history was a repeated measure. The net internal-external attribution score was used as the dependent variable. A positive score indicates that internal factors were rated as a relatively stronger cause for poor performance than external factors. Table 1

TABLE 1

ANOVA FINDINGS FOR NET ATTRIBUTION SCORES

Source	Sum of Squares	df	Mean Square	F-Score	Probability
Rank (R)	35.96	1	35.96	1.88	.176
Client History (CH)	746.37	1	746.37	33.96	.000
R×CH	18.09	1	18.09	.94	.33
Error	1034.41	54	19.15		
Work History (WH)	2561.98	1	2561.98	185.34	.000
R×WH	15.78	1	15.78	1.14	.290
CH×WH	21.51	1	21.51	1.56	.217
R×CH×WH	0.65	1	0.65	0.05	.984
Error	746.49	54	13.82		

TABLE 2

TREATMENT MEANS AND STANDARD DEVIATIONS

Treatment		Mean	Standard Deviation
Rank:	Senior	2.90	6.79
	Manager	1.79	6.63
Client History:	Unstable	−0.19	5.77
	Stable	4.91	6.65
Work History:	Bad	7.05	4.97
	Good	−2.32	4.62

presents the ANOVA findings and Table 2 provides treatment means and standard deviations.[1] The results supported hypotheses one and two. First, as predicted, significantly stronger internal attributions were found when the subordinate had a poor work history. Second, client history had a significant main effect on attribution judgments. As predicted, significantly stronger internal attributions were found for the stable client history condition. The results did not support our third hypothesis. Rank did not significantly affect attribution judgments. Further, the net attribution score was slightly larger for the manager group, which is not in the predicted direction.

Additional analysis was conducted to identify, to the extent possible, specific sources of the significant results. This is important because the implications related to different attributions are not the same. For example, performance failure attributed to a lack of effort as opposed to a lack of ability, while both internal, encourage different management responses.

ANOVA statistics were applied to each of the eight attribution scales individually. Table 3 shows the *F*-scores obtained

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[1] Additional tests conducted on the net attribution score found the distribution was not significantly different from the normal distribution and the variance was not significantly heterogeneous.

TABLE 3
SELECTED ANOVA RESULTS FOR EIGHT ATTRIBUTION SCALES

	F-Score	
Attribution Scale	*Client History*	*Work History*
Task Difficulty	9.85*	45.71*
Client's Cooperation	15.81*	44.08*
Staff's Effort/Ability	2.16	8.58*
Bad Luck	0.12	3.40
Senior's Effort	5.48*	72.69*
Senior's Leadership Ability	24.23*	177.75*
Senior's Decision-Making Ability	34.91*	104.96*
Senior's Intrinsic Motivation	12.48*	100.26*

* Significant at .02 or less.

on each attribution scale by the client history and work history factors. The client history influence was significant in its impact on all but clients' lack of cooperation and bad luck. The work history variable had a significant effect on seven of the attribution scales. Work history did not affect attributions of luck. Across both variables the most heavily influenced dimensions were the senior's leadership and decision-making ability. Conversations with auditors indicated that problems in these two areas often led to substandard performance. Auditors also indicated that effort and motivation typically are not problems because the firms seek to hire aggressive job candidates with high commitment and goal aspirations.

Action-Responses

To test the hypothesis that action-responses of auditors will be positively associated with causal attributions, the net response score was correlated with the net attribution score. A significant correlation ($r=.79$, $p>0.00$) was found. Rejection of the null hypothesis supports the fourth hypothesis.

Two other correlations were determined to provide additional evidence on the association between attributions and responses. First, the summed internal attribution and the internal response scores were correlated. A strong correlation was found between these two scores ($r=.82, p<.00$). Second, the summed external attribution and the external response were correlated. A lower but still significant correlation ($r=.39$, $p<.01$) was found. These two correlations were significantly different (using Fisher's z-statistic) at the .05 level.

DISCUSSION

This study has several limitations. First, since the subjects were not randomly selected, inferences cannot be made to auditors in general. Since the subjects were selected by a liaison officer with each participating firm, it is possible that the selection process contained systematic bias.

Second, the descriptions of poor performance contained in brief scenarios excluded many factors potentially relevant for the performance evaluation task. The results may not generalize to other settings. However, support for the attributional model has been found using work simulations, role playing, and films [Mitchell, Green and Wood, 1981].

Finally, the study measured intentions to act and not actual behaviors, so the correlations between the attributions and responses may be overstated.

The study found a significant work history main effect for attribution judgments. This is consistent with the results obtained in other work settings (see Mitchell, Green and Wood [1981]). However, the work history variable was extreme and unambiguous. Two improvements are possible in future studies. First, more ambiguous combinations of work history should be considered. Mitchell and Wood [1980] speculate that more ambiguous manipulations of work history would result in more uncertainty about attributions, more uncertainty about responses, and greater dependence on personal or organizational policies to make judgments. Second, consistency, distinctiveness, and consensus might be treated as three independent variables to determine which of the three significantly affected auditors' judgments.

The study also found the causal background to be a significant factor in auditors' attribution judgments. Previous attribution studies have not specifically examined the role of a causal background on an individual's judgments. However, the evidence from this study supports Einhorn and Hogarth's [1983] position that individuals' judgments take into account the causal background.

The rank of the subject did not affect attribution judgments. This suggests that managers and seniors do not have significantly different perspectives concerning the cause(s) of a senior's substandard performance. Both groups of subjects have performed the work of audit senior, which may have been the factor that led to similar attributions by both groups. Mitchell and Kalb [1982] found that experience with a job task reduced the attributional differences between an observer and an actor. However, differences between a poorly performing audit senior (an actor) and the supervisor (an observer) still may exist. For example, a self-serving bias may affect the attributions of a poorly performing audit senior. Future studies might examine the self-judgments made by poorly performing employees.

A significant association between attributions and responses was found. Stronger internal attributions were highly associated with responses directed towards the senior whereas stronger external attributions were less associated with responses directed towards the environment. Such differences between internal and external attributions and responses were not found by Mitchell and Wood [1980]. In a study of nursing supervisors, the association between internal attributions and an internal response ($r = .55$) was similar to the association for external attributions and an external response ($r = .64$). Our results may reflect differences in the tasks of auditors and nurses. Nurses may have a greater ability and desire to make changes in the situation than do auditors. First, it would be difficult for auditors to change client behavior whereas a nursing supervisor may be able to make changes in the task or the working environment. Second, since an auditor receives a new task at the end of an audit engagement, there may be little incentive to direct responses at the client. On the other hand, nursing supervisors do not change tasks on a regular basis and would have a greater incentive toward making changes in the working environment.

Many unanswered questions remain and continued research is needed to enhance our understanding of the performance evaluation process in the audit setting. Additional research might assess the effects of moderating variables on the attributions and responses of auditors.

Examples of moderating variables which may influence the formation of attributions include false consensus, self-serving bias, or the fundamental attribution error. Responses also may be moderated by a number of factors including the severity of the outcome of an event, the social context, impression-management tactics of the subordinate, the perceived ease to the supervisor of taking action, and organizational policies set by the firm.

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Characteristics of Dollar-Unit Taints and Error Rates in Accounts Receivable and Inventory

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ABSTRACT: This note extends the analysis of line-item error taints and error rates originally presented in Johnson, Leitch and Neter [1981] by first considering the distribution of dollar-unit taints, the relevant distribution when simple random sampling is applied to monetary units. Next, empirical evidence on the relation between the taint amount and book amount is presented. Finally, empirical findings on the magnitudes of dollar-unit error rates are provided.

In a recent article in THE ACCOUNTING REVIEW, we analyzed characteristics of errors found in accounts receivable and inventory audits [Johnson, Leitch and Neter, 1981]. This study was based on 55 accounts receivable audits and 26 inventory audits representing a variety of types of audits with errors for a Big Eight CPA firm's larger clients. The article considered error rates, error amount distributions, taint distributions, and the relation of error amount to book amount. Since the focus of the paper was on the nature of errors in accounting populations and since errors occur in line items, the analysis of taints and error rates was conducted on a line-item basis. The distributions of line-item taints and error rates presented showed the frequency of different taint amounts and error rates occurring in the line items in the population. These distributions are relevant when the auditor is interested in the nature of errors and in understanding how they occur.

The following characteristics of line-item taint distributions and error rates were observed in Johnson, Leitch and Neter [1981]:

1. The line-item taint distributions frequently have a discontinuity or spike at +100 percent taint. Often, the spike involves more than ten

After our 1981 paper was published, several colleagues asked why we had not analyzed the distribution of dollar-unit taints in our 1981 paper. Shortly, after we began this analysis, we received a formal note from Professor Wally Smieliauskas [1982] suggesting that such an analysis would be useful for those interested in dollar-unit sampling. We are indebted to him, a reviewer, and Associate Editor William R. Kinney, Jr. for helpful comments and suggestions.

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percent of the line items, especially in accounts receivable audits.

2. Large negative line-item taints are present in many inventory audits.
3. The mean taints per line item are generally smaller for inventory audits than for accounts receivable audits. The latter mean taints tend to be near .2 or higher.
4. The variability of line-item taint distributions tends to be large, particularly for inventory audits.
5. The shapes of the line-item taint distributions, ignoring the spike at the +100 percent taint, tend to be unimodal and negatively skewed for inventory audits and either reversed *J*-shaped or unimodal with right skewness for the predominant positive taints in receivables audits.
6. There is great variability among audits in the line-item error rates for both accounts receivable and inventories. Also, the line-item error rates for inventory audits tend to be substantially higher than those for accounts receivable.
7. There is some evidence from between-audits data that the line-item error rate for both types of audits may be higher for larger accounts than for smaller accounts.
8. There is strong evidence from within-audits data that the line-item error rate for both types of audits tends to increase as line item size increases.

When monetary-unit sampling is employed, monetary-unit taints and their distributions for different accounting populations are also of interest. Distributions for different accounting populations are also of interest. Distributions of monetary-unit taints show the frequency of each taint amount occurring in the monetary units of the population. These distributions are relevant because they are the appropriate distributions whenever monetary-unit sampling is modeled by means of simple random sampling of monetary units and the population size (in dollar units) is large. In effect, independent selections of monetary units from such a distribution then are made. In addition, the dollar-unit error rate may be important when monetary unit sampling is employed. Cox and Snell [1979], for instance, decomposed the estimation process into estimation of the dollar-unit mean taint and the dollar-unit error rate.

In this note, we first explain how a distribution of dollar-unit taints differs from the corresponding distribution of line-item taints. Next, we describe the characteristics of dollar-unit taint distributions in the ten accounts receivable audits and the ten inventory audits considered in the study by Johnson, Leitch and Neter [1981]. We then examine the relation between size of line-item taint and book amount. Finally, we explain how the dollar-unit error rate differs from the corresponding line-item error rate and analyze the dollar-unit error rates in the 81 audits which were considered in our 1981 paper.[1]

DOLLAR-UNIT TAINT DISTRIBUTIONS

Table 1 illustrates the difference between dollar-unit taints and line-item taints. In Table 1, there are four line-items in error and four different taint amounts. Thus, each line-item taint occurs with a frequency of 25 percent. However, when interest is in the number of dollars with a given taint, the relevant distribution is the distribution of dollar-

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[1] The audit data on which the Johnson, Leitch and Neter [1981] study was based were obtained by stratified sampling of line items. To obtain information about dollar-unit taint distributions and dollar-unit error rates from these data in this note, suitable weightings were employed which provide unbiased information about the dollar-unit characteristics.

TABLE 1

ILLUSTRATION OF THE DISTINCTION BETWEEN THE DISTRIBUTION OF LINE-ITEM TAINTS AND THE DISTRIBUTION OF DOLLAR-UNIT TAINTS

Line Item	(1) Error Amount (dollars)	(2) Book Amount (dollars)	(3) Taint (1)/(2)	(4) Number of Line-Item Taints	(5) Percent Distribution of Line-Item Taints	(6) Number of Dollars with Taint	(7) Percent Distribution of Dollar-Unit Taints
1	40	400	.10	1	25	400	40
2	60	300	.20	1	25	300	30
3	80	200	.40	1	25	200	20
4	100	100	1.00	1	25	100	10
Total		1,000			100	1,000	100

unit taints. This distribution is shown in column (7) of Table 1. It indicates, for example, that 40 percent of the 1,000 dollar units, or 400 dollar units, have a taint of .10 each.

Table 2 presents the dollar-unit taint distributions for the ten receivables and the ten inventory audits with the largest numbers of errors in the Johnson, Leitch and Neter study [1981]. The ranges of these distributions do not, of course, differ from those of the line-item taint distributions. Six interesting observations emerge from Table 2.

1. The dollar-unit taint distributions are much more concentrated near zero than the corresponding line-item taint distributions. For example, in seven of the ten receivables audits over 50 percent of the dollar units have taints which range from 0 to .09 whereas this is true for only two of the ten line-item taint distributions. Similarly, in six of the ten inventory audits, over 50 percent of the dollar units have taints which range from −.10 to .09 compared with only three of the ten line-item taint distributions. This is the result of the fact that line-items with larger book amounts in a majority of the audits tend to have smaller taints, for both overstatement and understatement errors, as will be noted in the next section.
2. The discontinuities or spikes at +100 percent taint tend to be much smaller for dollar-unit taint distributions than for line-item taint distributions, indicating that 100 percent taints more frequently occur in line-items with smaller book amounts. Nevertheless, for three of the 20 audits more than ten percent of the dollar units with errors have +100 percent taint (in one case, 66 percent of monetary units with errors have +100 percent taint), and the spikes involve at least five percent of the monetary units with errors in one-fourth of the audits. Thus, a non-negligible spike in the dollar-unit taint distribution is present in a considerable portion of the inventory and receivables audits.

Also, in two of the audits (six and 13) the spike at +100 percent taint is substantially greater for the dollar-unit taint distribution than for the line-item taint distribution.

TABLE 2

PERCENT DISTRIBUTIONS OF DOLLAR-UNIT TAINTS FOR RECEIVABLES AND INVENTORY AUDITS WITH LARGEST NUMBERS OF ERRORS

(a) Accounts Receivable Audits

Dollar-Unit Taint	*6*	*11*	*15*	*16*	*59*	*69*	*77*	*80*	*81*	*91*
Less than −1.00										
−1.00−− .91								e	1	
− .90−− .81		e				e				
− .80−− .71										
− .70−− .61										
− .60−− .51										
− .50−− .41		e								
− .40−− .31								e	1	
− .30−− .21						1				
− .20−− .11		1				.5		e	1	
− .10−− .0		34	5	14		36	1	4	10	
0+− .09	46	60	75	83	81	52	36	64	61	
.10− .19	13	e	3	3	9	5	15	12	5	
.20− .29	23		2		2	2	4			3
.30− .39			2			1	14	e	1	1
.40− .49	7	2	3		4		8			e
.50− .59			4		1			e		2
.60− .69			2			e	15	11		6
.70− .79			1				4			5
.80− .89			1						19	5
.90− .99			1		2					11
1.00	12	1	3	e	.5	2	4	7	2	66
More than 1.00	.5				e					
Total	100	100	100	100	100	100	100	100	100	100

(b) Inventory Audits

Dollar-Unit Taint	*13*	*14*	*22*	*23*	*24*	*27*	*32*	*33*	*56*	*60*
Less than −1.00	2	2	1	1	e	e	1	1		1
−1.00−− .91		1								
− .90−− .81	1			e	1					1
− .80−− .71	1	e	e	e			1		e	
− .70−− .61	1		e	e			e			
− .60−− .51	e		e	e		e				
− .50−− .41	1		1	1	e				e	1
− .40−− .31	3	.5	e	.5	e		e			4
− .30−− .21	8	2	2	2	e	1	1	1	e	1
− .20−− .11	7	8	3	4	4	2	6	9	2	8
− .10−− .0	16	26	23	24	26	7	31	5	14	13
0+− .09	24	29	36	35	47	29	52	15	63	21
.10− .19	9	17	13	12	9	24	5	16	16	14
.20− .29	10	8	6	6	7	21	1	14	4	5
.30− .39	3	2	3	2	2	2		13	e	6
.40− .49	4	2	2	2	1	3		9		3
.50− .59	e		e	1	1	2		7		2
.60− .69	1	2	1	1	1	2		5		e
.70− .79	e	e	e	e		1		3		3
.80− .89	e		e	e			e	1		1

TABLE 2—*(Continued)*

Dollar-Unit Taint	*13*	*14*	*22*	*23*	*24*	*27*	*32*	*33*	*56*	*60*
.90– .99	1		8	8		5	e	2		2
1.00	7		e	e		1	1	1		12
More than 1.00										
	100	100	100	100	100	100	100	100	100	100

e–less than .5%
Note: Numbers may not add to 100 because of rounding.

Thus, in these audits the +100 taints tend to occur more frequently in line items with larger book amounts.

3. The shapes of the dollar-unit taint distributions are similar to those of the corresponding line-item taint distributions. The distributions of dollar-unit taints in inventories tend to be unimodal with two tails for large positive and negative taints, and with a spike at the +100 percent taint for several of the audits. The distributions of dollar-unit taints for receivables tend to be more complex. The overstatement portion, which is the predominant one for most receivables distributions, tends to be either reversed *J*-shaped or unimodal with a right skewness. For most receivables audits, there is also a spike at +100 percent taint.
4. The mean dollar-unit taints for receivables audits tend to be larger than those for inventory audits, just as was the case for the mean line-item taints, but the differences generally are much smaller. This may be seen from Table 3, which presents the means, standard deviations, and measures of skewness for both the line-item and dollar-unit taint distributions for the 20 audits with the most errors. It is clear from Table 3 that the median of the mean dollar-unit taints for the ten receivables audits is much closer to the median of the mean dollar-unit taints for the inventory audits than is the case for the line-item taints. The reason for the difference in behavior is that for most receivables audits (but not all—audit six is an exception), the mean dollar-unit taint is smaller than the corresponding mean line-item taint, while the reverse holds for most inventory audits (audit 24 is an exception). These shifts in the mean taints are the result of the fact that large positive line-item taints in the receivables audits and large negative line-item taints in the inventory audits often tend to occur for items with smaller book amounts.
5. As noted earlier, the distributions of dollar-unit taints tend to be more concentrated than those for line-item taints, for both types of audits. This can be seen directly from the standard deviations in Table 3. Most, but not all, of the dollar-unit taint distributions have a smaller standard deviation than that of the corresponding line-item taint distri-

TABLE 3

MEANS, STANDARD DEVIATIONS, AND SKEWNESSES FOR DISTRIBUTIONS OF LINE-ITEM AND DOLLAR-UNIT TAINTS

	Mean		*Standard Deviation*		*Skewness*	
Audit Number	*Line-Item*	*Dollar-Unit*	*Line-Item*	*Dollar-Unit*	*Line-Item*	*Dollar-Unit*
			(a) Accounts Receivable Audits			
6	.19	.24	.11	.31	2.16	1.69
11	.06	.02	.33	.14	1.30	4.73
15	.47	.13	.33	.24	.21	2.37
16	.18	.01	.35	.03	1.86	8.05
59	.59	.09	.42	.18	−.04	3.56
69	.22	.04	.47	.16	.17	3.71
77	.49	.28	.33	.28	.30	.88
80	.77	.17	.35	.31	−1.15	1.56
81	.93	.19	.19	.36	−3.61	1.12
91	.95	.92	.15	.17	−3.21	−2.34
Median	.48	.15	.33	.21	.19	2.03
			(b) Inventory Audits			
13	−.70	.06	3.64	.52	−5.32	−11.60
14	−.02	.03	.34	.25	−1.74	−1.68
22	−.39	.10	2.97	.54	−6.42	−16.59
23	−.13	.10	1.98	.46	−9.73	−11.99
24	.08	.03	.22	.16	−.68	−.81
27	−.29	.20	2.81	.35	−8.44	−9.88
32	−.02	−.01	.50	.26	−4.18	−4.12
33	−.29	.24	2.17	.34	−3.56	−4.39
56	.03	.05	.15	.09	−2.29	−2.57
60	.14	.19	.50	.42	.41	.34
Median	−.08	.08	1.24	.35	−3.87	−4.26

bution. The decreases in the variability of the dollar-unit taint distributions are particularly large for inventory audits. Again, this is related to large absolute taints frequently being associated with items having smaller book amounts.

6. The dollar-unit taint distributions for receivables audits frequently are more skewed than the corresponding line-item taint distributions. Also, for several accounts receivable audits, the direction of skewness is reversed from one to the other of the taint distributions.

RELATION BETWEEN SIZE OF LINE-ITEM TAINT AND BOOK AMOUNT

To investigate the relation between the size of line-item taint and book amount, we separated the negative and positive taints so that the differences in signs do not complicate the analysis. We then divided each group of line-item taints into two subgroups according to the book amount of the line item. The division was made in such a way that each subgroup contained approximately the same number of line items. (An exact division usually was not possible because of the

TABLE 4

MEDIAN TAINTS BY BOOK AMOUNT FOR POSITIVE TAINTS

Audit	*Small Book Amounts*	*Large Book Amounts*
	(a) Accounts Receivable Audits	
6	.257	.184
11	.052	.020
15	.586	.299
16	.121	.011
59	1.000	.164
69	.625	.087
77	.787	.208
80	1.000	.147
81	1.000	.843
91	1.000	1.000
Median	.706	.348
	(b) Inventory Audits	
13	.138	.143
14	.128	.039
22	.138	.037
23	.138	.087
24	.115	.122
27	.076	.102
32	.005	.027
33	.714	.270
56	.064	.054
60	1.000	.250
Median	.133	.096

weightings required—see Johnson, Leitch and Neter [1981, p. 292]). We then calculated the median taint for each subgroup to see whether the size of taints is affected by the size of the book amount. The results are presented in Tables 4 and 5.

For nine of the ten receivables audits and six of the ten inventory audits, the median positive taint for small book amount line items exceeds the corresponding median taint for large book amount line items, the differences being especially large for the receivables audits. Thus, the size of positive taints is frequently (but not always) inversely related to book amount. Similar findings for negative taints are shown in Table 5, which indicates that in all receivables audits and in eight of the ten inventory audits the magnitude of line-item taints is inversely related to book amount.

These results are consistent with the findings in Johnson, Leitch and Neter [1981] that in most audits there is no aggregate linear relation between error amount and book amount, thus implying smaller taints for larger book amount line items.

DOLLAR-UNIT ERROR RATES

As indicated earlier, an analysis of line-item error rates is important in understanding the nature of errors and how they occur. However, an analysis of dollar-unit error rates is also important

TABLE 5

MEDIAN TAINTS BY BOOK AMOUNT FOR NEGATIVE TAINTS

Audit	*Small Book Amounts*	*Large Book Amounts*
	(a) Accounts Receivable Audits	
11	−.045	−.00064
15	−.006	−.0022
16	−.0194	−.0002
69	−.208	−.0066
80	−.130	−.0148
81	−.0692	−.0148
Median	−.0571	−.0044
	(b) Inventory Audits	
13	−.250	−.219
14	−.141	−.085
22	−.387	−.073
23	−.186	−.077
24	0.000	−.006
27	−.158	−.053
32	−.006	−.004
33	−.239	−.133
56	−.078	−.065
60	−.036	−.119
Median	−.150	−.075

because this error rate can be used—for instance, by Cox and Snell [1979]—in modeling simple random sampling of dollar units. Also, the dollar-unit rate is important to practitioners who are concerned about the likelihood that the sample will contain any errors.

The distinction between the line-item error rate and the dollar-unit error rate is shown in Table 6. In this table, two of the four line items are in error, and therefore, the line-item error rate is .50. However, errors occur in accounts with a total book value of $600 out of a population total book amount of $1,000. Hence, the dollar-unit error rate is .60.

Table 7 presents the distributions of dollar-unit error rates for 55 accounts receivable and 26 inventory audits with errors. Three interesting observations emerge from Table 7:

1. The dollar-unit error rates for both types of audits tend to be higher than the line-item error rates. For example, the median line-item error rate for receivables is .024 whereas the median dollar-unit error rate is .040. The corresponding figures for inventory audits are .154 and .186. This finding is consistent with our 1981 finding that the line-item error rate tends to increase for both types of audits as line-item book amount increases.
2. There is great variability between audits containing errors in the dollar-unit error rates, for both types of audits. This finding is consistent with our 1981 finding that line-item error rates are quite variable between audits.
3. The dollar-unit error rates for in-

Table 6

Illustration of Distinction Between Line-Item Error Rate and Dollar-Unit Error Rate

Line Item	*Error Amount (dollars)*	*Book Amount (dollars)*
1	0	100
2	10	200
3	0	300
4	5	400
Total	$15	$1,000

$$\text{Line-item error rate} = \frac{\text{Number of line items in error}}{\text{Total number of line items in population}}$$

$$= 2/4$$

$$= .50$$

$$\text{Dollar-unit error rate} = \text{Total book amount of line items containing errors/Total book amount of all line items in population}$$

$$= \$600/\$1{,}000$$

$$= .60$$

ventory audits with errors tend to be substantially higher than those for accounts receivable. This also is consistent with our 1981 finding that line-item error rates for inventory are substantially higher than line-item error rates for accounts receivable in audits containing errors.

Interest also exists in the comparative prevalence of overstatement and understatement taints in the dollar units with errors in the population. Table 8 presents information about the proportion of dollar units, with errors that contain positive errors (positive taints) as opposed to negative errors. Specifically, Table 8 presents the distributions of the proportions of overstatement dollar-unit errors in 55 receivables and 26 inventory audits with errors. The principal finding from Table 8 is that the distributions of the proportions of overstatement errors when measured on a dollar-unit basis are quite similar to the corresponding distributions measured on a line item basis, for both types of audits. For example, 76.4 percent of the receivables audits contain line-item overstatement proportions between .90 and 1.0, and for dollar-unit taints this proportion is also 76.4 percent. As for the line-item analysis, the analysis in terms of dollar units shows that taints in accounts receivable audits are almost entirely positive whereas overstatement and understatement taints in inventory audits are more balanced.

Summary and Discussion

Summary

The principal findings from this study may be summarized as follows:

1. The dollar-unit taint distributions are much more concentrated near zero than the line-item taint distri-

TABLE 7

DISTRIBUTIONS OF DOLLAR-UNIT ERROR RATES FOR RECEIVABLES AND INVENTORY AUDITS WITH ERRORS

Dollar-Unit Error Rate	*Number of Audits*	*Percent of Audits*	*Cumulative Percent*
	(a) Accounts Receivable Audits		
Less than .005	13	23.6	23.6
.005- .024	9	16.4	40.0
.025- .088	11	20.0	60.0
.089- .120	7	12.7	72.7
.121- .163	5	9.1	81.8
.164- .266	4	7.3	89.1
.267-1.000	6	10.9	100.0
	55	100.0	
	Median	.040	
	First quartile	.005	
	Third quartile	.130	
	(b) Inventory Audits		
Less than .074	7	26.9	26.9
.074-.139	4	15.4	42.3
.140-.296	4	15.4	57.7
.297-.416	4	15.4	73.1
.417-.645	2	7.7	80.8
.646-.968	5	19.2	100.0
	26	100.0	
	Median	.186	
	First quartile	.070	
	Third quartile	.598	

butions. This is a consequence of line items with larger book amounts tending to have smaller taints, for both overstatement and understatement errors.

2. The spikes at +100 percent taint tend to be much smaller for dollar-unit taint distributions than for line-item taint distributions, the result of 100 percent taints occurring more frequently in line items with smaller book amounts.
3. The shapes of the dollar-unit taint distributions are similar to those of the corresponding line-item taint distributions.
4. The mean dollar-unit taints for receivables audits tend to be larger than those for inventory audits, but the differences generally are much smaller than those for mean line-item taints.
5. In the majority of audits, the size of positive taints tends to vary inversely with book amount, and the same holds for negative taints.
6. Dollar-unit error rates for both types of audits tend to be higher than the line-item error rates.
7. There is great variability in the dollar-unit error rates among audits. Also, the dollar-unit error rates

TABLE 8

DISTRIBUTIONS OF PROPORTION OF OVERSTATEMENT DOLLAR-UNIT TAINTS IN RECEIVABLES AND INVENTORY AUDITS WITH ERRORS

Proportion of Overstatement Taints	*Number of Audits*	*Percent of Audits*	*Cumulative Percent*
	(a) Accounts Receivable		
.10–.19			
.20–.29			
.30–.39			
.40–.49	1	1.8	1.8
.50–.59	2	3.6	5.4
.60–.69	2	3.6	9.0
.70–.79	5	9.1	18.1
.80–.89	3	5.5	23.6
.90–.999	8	14.5	38.1
1.0	34	61.9	100.0
	55	100.0	
	(b) Inventory		
.10–.19	1	3.8	3.8
.20–.29	1	3.8	7.6
.30–.39	2	7.7	15.3
.40–.49	2	7.7	23.0
.50–.59	1	3.8	26.8
.60–.69	9	34.7	61.5
.70–.79	4	15.4	76.9
.80–.89	3	11.6	88.5
.90–.999	1	3.8	92.3
1.0	2	7.7	100.0
	26	100.0	

tend to be substantially higher for inventory audits than for receivables audits. These findings parallel the earlier ones for line-item error rates.

8. The distributions of the proportions of overstatement errors in audits when measured on a dollar-unit basis are very similar to the corresponding distributions measured on a line-item basis.

Discussion

The shapes of the dollar-unit taint distributions are sufficiently varied that it is unlikely that any one model, such as an exponential distribution, can be used satisfactorily in all cases to describe dollar-unit taint distributions. Similarly, it would be dangerous to assume that large taints always are associated with small book amount items, since in several audits included in the study large taints were associated with large book amount items. Also, it would appear that adequate models for at least some audits will need to include a discrete probability at +100 percent taint. These results suggest the desirability of using statistical inference procedures that are robust to assumptions about the shape of the dollar-unit taint distribution, including whether or not a substantial spike at + 100 percent taint is present.

The limitations of the data base noted in Johnson, Leitch and Neter [1981, p. 292] apply here also. In particular, the audits studied came from only a single C.P.A. firm and were not randomly selected.

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A Comparison of Alternative Methods of Estimating Constant Dollar Depreciation

Daniel G. Short

ABSTRACT: Previous research has questioned the use of COMPUSTAT capital expenditures data to layer fixed assets for the purpose of estimating constant dollar depreciation. This note compares the layering technique with the more popular alternative, the average age method. Estimated amounts were compared with actual data reported under FASB #33. The results indicate that the layering method provides estimates that exhibit less error, bias, and variance.

ESTIMATES of constant dollar (CD) restated accounting information have been and continue to be used in a variety of research studies. The recent FASB decision to eliminate CD disclosures means that analysts and researchers who need CD data will have to rely on estimated data. A significant part of the CD restatement procedure involves restating depreciation expense. Two procedures for estimating CD restated depreciation expense have been discussed in the literature: a composite age method [Davidson and Weil, 1975] and a layering method [Short, 1978]. The purpose of this paper is to compare the estimation accuracy of the two methods. The first part of the paper explains the estimation procedures and the second part presents the test results.

ESTIMATION METHODS

The composite age method estimates the average age of property, plant and equipment as (Accumulated Depreciation)/(Depreciation Expense). Historical cost depreciation then is restated to constant dollars with the restatement factor that is appropriate for the average age of the property, plant, and equipment. Davidson and Weil use an age-reducing factor if the company does not use straight-line depreciation, while Parker [1977] makes no such adjustment. Ketz [1978] compared the Davidson-Weil and Parker approaches and found very small differences. The small differences are not surprising because *Accounting Trends and Techniques* reports that over 95 percent of the companies in their sample use straight-line depreciation for at least some assets.

Under the layering method, capital expenditures are layered starting with the current year and working back in years until the total of capital expenditures equals the total of the plant account. This procedure, in effect, assumes a FIFO

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flow through the plant account. As a result of the large amount of data required by this method, the COMPUSTAT tape often is used as a data source.

The layering method has not been widely used, perhaps as the result of research by Thies and Revsine [1977] who identified potential problems with the method:

> It appears that the definitions and policies employed in the reporting of capital expenditures on COMPUSTAT result in data which are not appropriate for refined estimation procedures. . . .COMPUSTAT capital expenditures can lead to biased dated-layering of fixed assets. . . The numbers which result may not be sufficiently accurate for the more ambitious research issues now contemplated [Thies and Revsine, 1977, p. 220].

The issue of what level of accuracy is "sufficient" is a difficult one. One approach to resolve the issue is to compare alternative methods of making an estimate and select the method with the smallest error. The next section of this paper describes tests that were performed to compare the estimation accuracy of the average age and layering methods.

RESEARCH METHOD

The sample includes companies listed on both COMPUSTAT and the FASB Statement 33 Data Bank with December and January fiscal year-ends. Companies with missing data for capital expenditures (COMPUSTAT variable 30) were eliminated.[1] After all eliminations, the final sample contained data for 1979, 1980, and 1981, providing a total of 1,402 observations.

Three error metrics were calculated:

(1) Mean Absolute Error,

$$MABE = \frac{1}{N} \sum_{i=i}^{N} \left| \frac{P_i - A_i}{A_i} \right|;$$

(2) Mean Squared Error,

$$MSE = \frac{1}{N} \sum_{i=i}^{N} \left[\frac{P_i - A_i}{A_i} \right]^2; \text{ and}$$

(3) Average Error,

$$AVE = \frac{1}{N} \sum_{i=i}^{N} \frac{P_i - A_i}{A_i},$$

where P_i = Predicted depreciation expense for firm i, and A_i = Actual depreciation expense for firm i.

The three error measures give differential weighting to different types of errors. Mean Absolute Error gives equal weight to all errors while Mean Squared Error gives greater weight to large errors. The Average Error measure allows errors to cancel each other. This measure evaluates the quality of aggregate estimates and allows inferences to be drawn concerning bias.

RESULTS

As reported in Table 1, the layering method provides less average estimation error than the average age method for all error measures and all years. The average age method tends to consistently overestimate depreciation expense (approximately 80 percent of the estimates were greater than the actual value). Thus, the average age method has relatively large

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[1] One of the costs associated with using the layering method is the large amount of data required. For purposes of this study, companies with any missing data were eliminated. As a result of this stringent requirement, 97 companies were lost. For other studies these companies could be saved with the use of simple heuristics (such as estimating missing data with the latest available capital expenditure amount) or with the average age method. Heuristics were not used in this study to avoid the appearance of fitting the layering method to the data.

TABLE 1
COMPARISON OF ESTIMATION METHODS

		Average Age Method			
	n	*MABE*	*MSE*	*AVE*	*Std. Dev.*
1979	461	.143	.032	.116	.140
1980	477	.144	.033	.121	.139
1981	464	.146	.035	.120	.140
Total	1402	.145	.033	.119	.140

		Layering Method			
	n	*MABE*	*MSE*	*AVE*	*Std. Dev.*
1979	461	.084	.020	.016	.109
1980	477	.089	.013	.019	.113
1981	464	.098	.015	.014	.121
Total	1402	.091	.014	.016	.114

errors and a positive bias. The estimation errors for the layering method are not consistent in sign (only 55 percent of the estimates were greater than the actual value). As a result, the errors tend to offset each other and produce the small average error reported in Table 1.[2]

Twenty-four industry classifications (at the two-digit SIC level) with five or more companies were examined to determine if the results reported in Table 1 were consistent across all industries. The layering method produced smaller estimation errors than the average age method for all error measures and for all industries with the exception of utilities. Depreciation expense for the utilities showed the largest average change under constant dollar restatement. Both estimation methods underestimated constant dollar depreciation for the utilities, but the average age method was more accurate for this one industry classification.

To gain further insight into the nature of the errors, 50 companies with large estimation errors for both methods were selected at random and their FASB #33 disclosures were examined. In 17 cases, the cause of the large estimation error was a recording error in the FASB Data Base. The majority of these recording errors occurred when the company reported constant dollar depreciation as an adjustment to historical cost depreciation. In some cases, this *adjustment* was recorded on the FASB tape as the *amount* of constant dollar depreciation. The data for these 17 companies were corrected so that the results are based on the data actually reported by the companies.

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[2] Both methods tend to overestimate actual depreciation expense. If it were possible to modify the methods to correct for the small bias in the layering method and the larger bias in the average age method (i.e., center the distribution of estimation errors on zero), the layering method would still offer the advantage of having a smaller standard deviation of the estimation errors.

A large source of estimation error was inconsistency between historical cost data and FASB #33 data. In 30 percent of the cases that were reviewed, the historical cost depreciation reported in the FASB #33 footnote was different than the amount reported in the basic financial statement. In 14 percent of the cases, there was a change in the estimated life or depreciation method for the calculation of constant dollar depreciation. FASB #33 suggests that inflation may affect the choice of depreciation method or estimated life under historical cost accounting. In such cases, companies may use a different life or method under constant dollar accounting.

There were miscellaneous causes of estimation errors in ten percent of the cases. These causes included write-downs of constant dollar amounts to value in use and the inclusion of gains and losses on disposition as an adjustment to depreciation expense.

The review of the 50 annual reports failed to uncover an explanation for estimation errors in only six cases. The review also failed to uncover any systematic pattern to the errors (e.g., industry, capital intensity, line of business).

CONCLUSIONS

The most significant conclusion of the study is that prior criticism of the layering method appears unwarranted. Under all comparisons (with the exception of utilities), the layering method was shown to be superior to the average age method. Researchers contemplating using estimation models for studies involving time-series data or involving companies not reporting data under FASB #33 should consider the use of the layering method over the heretofore more popular average age method.

An unexpected finding is that estimation models can be used as a quality control check. Seventeen errors in the FASB Data Base were uncovered by comparing estimated values to reported values.

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A Note on Internal Control Systems with Control Components in Series

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ABSTRACT: This paper presents a reliability model of a control system with control components in series. The results show that output reliability may increase or decrease as new control components are added to the series, depending on the characteristic reliability parameters of the control components. The results are compared with Bodnar's [1975] results that led him to the paradoxical conclusion that fewer control components are better than more in a serial system. It is observed that no such paradox exists when the controls are modeled properly.

THIS note demonstrates the non-existence of a paradoxical result that was confronted by Bodnar [1975] in developing a reliability model of an internal control system with n control components in series. Bodnar argued that the reliability of such a control system is given by

$$R_o' = r^n, \tag{1}$$

where r represents the reliability of each control component in the system. It appears from (1) that the reliability of the system, R_o', decreases as n increases. A system appears to become less reliable when more control components are introduced. This result is not in agreement with common sense and thus presents a paradox as pointed out by Bodnar [1975, p. 756]:

> Reliability theory suggests that few is better than more in a serial system, because of the workings of the product rule. Intuitively, one would expect that the more checks in a system, the more reliable it is.

However, equation (1) is based on a system where *all* components must function for the system to work; in an internal control system only one component must detect an error. When the system incorporates proper control characteristics (see Yu and Neter [1973], Cushing [1974], Grimlund [1982], and Srivastava and Ward [1983]) the paradox is nonexistent and the result is in agreement with common sense.

The function of a control component is to prevent, detect, and/or correct errors in input information, i.e., a control component has diagnostic capabilities. Srivastava and Ward [1983] pointed out that three parameters are required to de-

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TABLE 1

RELIABILITY OF OUTPUT INFORMATION, R_o, FOR $R_i=0.8$

No. of Control Components in Series	R_o							
	R_o increases with n					*R_o decreases with n*		
	$P_w=1.0$ $P_c=1.0$ $P_e=0.9$	$P_w=1.0$ $P_c=0.92$ $P_e=0.9$	$P_w=1.0$ $P_c=0.9$ $P_e=0.7$	$P_w=0.9$ $P_c=0.9$ $P_e=0.7$	$P_w=1.0$ $P_c=1.0$ $P_e=0.1$	$P_w=1.0$ $P_c=0.9$ $P_e=0$	$P_w=1.0$ $P_c=0.9$ $P_e=0.1$	$P_w=0.9$ $P_c=0.9$ $P_e=0.1$
0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
1	0.98	0.916	0.86	0.854	0.82	0.72	0.74	0.746
2	0.998	0.9183	0.872	0.8691	0.838	0.648	0.692	0.70172
3	0.9998	0.9184	0.8744	0.8734	0.8542	0.583	0.6536	0.66541
4	0.99998	0.9184	0.8749	0.8745	0.8688	0.525	0.6229	0.63564

scribe properly the function of a control component:

P_w = Probability that a control component is in operation,

P_c = Probability that a control component makes a correct decision given that the input information is correct, and

P_e = Probability that a control component makes a correct decision (i.e., it detects and corrects an input error) given that the input information is in error.

The reliability of output information from a system of n control components in series with identical reliability parameters is (see the Appendix)

$$R_o=R_i[1-P_w+P_w(P_c-P_e)]^n \\ +P_e[1-\{1-P_w+P_w(P_c-P_e)\}^n] \\ /[1-(P_c-P_e)]. \tag{2}$$

This equation represents a general relationship between the reliability of the output information, R_o, and the reliability of the input information, R_i, the number of components, n, and the characteristic parameters P_w, P_c, and P_e of the control components.[1]

When the controls are always in operation ($P_w=1$) and they do not have capabilities to correct errors in the input information ($P_e=0$), then the output reliability reduces to an expression similar to Bodnar's result:

$$R_o=R_iP_c^n. \tag{3}$$

As one can see from (3), R_o decreases as n increases for $P_c<1$. Thus, if the control components are functioning in such a way that they are *not capable* of correcting errors that are present in the input information ($P_e=0$) but can *further contaminate* the correct input ($P_c<1$), then the reliability of the output information decreases as an additional control component is introduced into the series.

However, when the controls are in operation (either part of the time or all the time, i.e., $P_w>0$) and they are capable of correcting errors that are present in the input ($P_e\neq0$), the reliability of the output information increases as more components are introduced into the system, provided the probability P_c that the controls do not contaminate a correct input is high enough. This can be seen from columns 2–6 of Table 1. It can also be observed that the incremental change in R_o due to the addition of a control component in the series is higher for a higher value of P_e (compare column 2 with column 6). These results make intuitive sense because a control component that corrects an input error with a high probability and contaminates a correct input with a low probability should increase the output reliability, and as the probability to correct an error in the input increases, the output reliability should increase. If a control component never contaminates a correct input ($P_c = 1$) and it has the capability to detect and correct input errors ($1 \geq P_e > 0$), then the output reliability always increases when such a component is added to the system. Furthermore, one can observe that the output reliability R_o increases less rapidly with n for lower values of P_c and P_w than its increase for higher values of the parameters (compare columns 2 with 3, and 4 with 5).

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[1] One can also use the Cushing [1974] approach or the Yu and Neter [1973] approach for the present study, but the absence of the parameter P_w in their treatment makes their results less generalizable. When $P_w=1$ in (2), the expression reduces to an expression similar to the one obtained directly by using either the Yu and Neter or Cushing approach.

For $P_c < 1$ and for a relatively low value of P_e, R_o decreases as n increases (see columns 7–9 of Table 1). This result again makes intuitive sense because when a control introduces errors in a correct input ($P_c < 1$) and is not good at detecting and correcting errors in the input ($P_e \leqslant 1$), then naturally the output reliability decreases when such a component is added to the system. It is interesting to note from columns 8 and 9 of Table 1 that R_o decreases more rapidly with n as P_w is increased. The reason for this result is that adding a control component which contaminates a correct input and has low probability for correcting an error in the input reduces R_o; more such components lead to more contamination in the output.

Thus, as discussed above, an increase or a decrease in the output reliability is possible when the number of control components in a series is increased, depending on the values of the characteristic parameters of the control components. This result has an important practical implication in that simply increasing the number of control components in a series will not necessarily increase output reliability; one must choose components with high values of P_c and P_e to increase R_o. In conclusion, this study has demonstrated results that make intuitive sense for the reliability of a series of control components. Thus, it demonstrates that the paradox encountered by Bodnar [1975] does not exist.

APPENDIX

A reliability model of a system of n control components in series is developed here. The model incorporates Bodnar's assumption that the components are identical in terms of their characteristic parameter values, i.e., they all have the same values for P_w, P_c, and P_e. An easy way to derive this model is to consider the output from one component as an input to the next one in the series, starting from the first component and continuing on to the last one.

The reliability of the output information from the first component is (Srivastava and Ward [1983, p. 30])

$$\begin{aligned} R_1 &= P_w[R_i P_c + (1 - R_i)P_e] + (1 - P_w)R_i \\ &= R_i[1 - P_w + P_w(P_c - P_e)] + P_w P_e. \end{aligned} \tag{A-1}$$

Using this as the reliability of the input information for the second component, one can write the reliability of the output information from this (second) component as

$$\begin{aligned} R_2 &= R_1[1-P_w+P_w(P_c-P_e)]+P_wP_e \\ &= R_i[1-P_w+P_w(P_c-P_e)]^2+P_wP_e[1-P_w+P_w(P_c-P_e)]+P_wP_e. \end{aligned} \tag{A-2}$$

Continuing the above procedure for *n* components, one obtains

$$\begin{aligned} R_o = R_i[1-P_w+P_w(P_c-P_e)]^n+P_wP_e[\{1-P_w+P_w(P_c-P_e)\}^{n-1} \\ +\{1-P_w+P_w(P_c-P_e)\}^{n-2}+\ \ldots\ +1], \end{aligned} \tag{A-3}$$

which reduces to

$$R_o=R_i[1-P_w+P_w(P_c-P_e)]^n+P_e[1-\{1-P_w+P_w(P_c-P_e)\}^n]/[1-(P_c-P_e)]. \tag{A-4}$$

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EDUCATION RESEARCH

Jack E. Kiger, Editor

Admission to Accounting Programs: Using a Discriminant Model as a Classification Procedure

Ronald L. Clark and Robert B. Sweeney

ABSTRACT: This paper uses discriminant analysis as a foundation for an admissions policy for accounting majors. The discriminant model is capable of correctly classifying students into Accept/Reject groups with a statistical accuracy of 78 percent using only three characteristics—grade-point average at 45 semester hours, grade in college mathematics, and grade in English composition. The model, more importantly, correctly classifies 90 percent of those students who, according to the model's criterion, should be rejected. Alternatively, the model is capable of identifying the same percent of those students who perform exceedingly well in accounting. This technique, together with a review and appeal procedure, provides a method of restricting enrollment while still meeting today's demand for quality accounting students.

MOST accounting programs have experienced increasing enrollments in recent years. The continued demand for accounting graduates as reflected by the job market, the escalating salaries, and the desire of students to enroll in programs which prepare them for careers as professional accountants have resulted in burgeoning enrollments. Projections of continued increases have been made by numerous groups including the Southern Regional Education Board [1978], which indicated that the prime demand for college graduates in 1985 and the years immediately thereafter will be for those majoring in accounting, computer science, and engineering.

Response to the increased demand has been hampered by the shortage of terminally qualified faculty, limited physical facilities, and restrictions on funding experienced by many universities. Faced with the inability to meet this demand for accounting graduates, a logical step is to restrict enrollment. Obviously, a major problem is determining criteria for restricting admission into accounting programs. One approach is to admit students

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as accounting majors according to their academic performance.

If enrollment is to be restricted, a decision must be made as to the point in the academic program at which the screening should take place. A general guideline is that the decision should be made as early as possible to permit most effective use of resources. Another guideline is that the criteria used to restrict enrollment have a high probability of correctly identifying those students that should be rejected and those that should be accepted into the accounting program. The optimum timing represents a trade-off between these two guidelines. The problem confronting accounting educators, therefore, is one of identifying and classifying students at an early stage in their academic programs.

METHODS OF IDENTIFICATION

Previous research in developing admission policies has employed either regression or discriminant analysis. Those studies using regression have concentrated on high school seniors entering college or undergraduates applying for graduate admission. Baird [1969] reported a correlation coefficient of .62 using ACT scores to predict academic performance for entering freshmen. In a study of graduate admissions, Mehrabian [1969] formed several models using a variety of undergraduate variables and reported correlation coefficients as high as .57. (See also Platz, McClintock and Katz [1959] and Dawes [1971] for other studies with similar predictive results.) In a study specific to accounting, Delaney, et al. [1979] developed an admissions test as an accept/reject device for students planning to enroll in the first intermediate course. The study reported correlation coefficients of .58.

Multiple discriminant analysis (MDA) has been used by accounting researchers to form classifications such as bankrupt/non-bankrupt firms [Altman, 1968], tax cases and regulations [Madeo, 1979], and accounting principles [Deakin, 1979]. These MDA studies reported correct overall classification results ranging from 78 to 95 percent. The error rates for classification of individual groups varied from three to 22 percent.

Eckel and Johnson [1983] use MDA to classify accounting students into two achievement groups based on a criterion variable similar to that used in this paper. Using a Bayesian procedure, their model achieved a 94 percent correct classification of the acceptance group (45 of 48 students). The rejection group, however, had a misclassification of 43 percent (nine of 21 students). Their use of prior probabilities biased the model towards the correct classification of the acceptance group at the expense of incorrectly classifying students in the rejection group.

Dockweiler and Willis [1984] also used MDA to classify students based on the three independent variables of overall grade-point average in college and grades in the two introductory accounting courses. While the model did achieve an overall correct classification of 81 percent, more importantly, it produced a significant misclassification of 28 percent of the rejection group. Their results and those of the Eckel and Johnson study indicate that enrollments will be inflated by the inclusion of marginally qualified students, which nullifies the objective of reducing student population by eliminating the poorer students.

We selected MDA as the method for developing our admissions model for two reasons. First, our purpose is to classify students into one of two groups; MDA accomplishes this objective through development of a classification function and a cut-off point for group boundaries. Second, many of the admission policies used by universities either are discriminant models or at least are similar in nature to MDA. These non-statistical models provide for a cut-off point and use a weighting scheme for a group of variables (both our universities use such a system). We believe, therefore, that other faculty and administrators will be more receptive to a discriminant approach.

NATURE OF DISCRIMINANT ANALYSIS

Multiple discriminant analysis (MDA) has been applied to various decision-making processes which involve classification of individuals into two or more groups. The underlying concept of MDA is that individual cases may be separated into two or more groups based on an analysis of their characteristics. MDA is most valuable when many individual cases are very similar in a number of measurements. The cases can not, however, be separated into different classes on the basis of any single measurement. MDA combines the characteristics through a weighting procedure so that it is possible to differentiate among classes of individual cases. The objective is to find some combination of measurements which will provide an index for classifying the individual cases.

Mathematically, the discriminant function is

$$D_i = d_{i1}Z_1 + d_{i2}Z_2 + \ . \ . \ . \ d_{ip}Z_p,$$

where D_i is the discriminant score for case i, d_{i1}, d_{i2} . . . d_{ip} are the discriminant variables, and Z_1, Z_2 . . . Z_p represents the weights associated with each individual variable. The discriminant scores of all cases belonging to a particular group are averaged to provide a Group Centroid which represents the most typical location within that group. An average of the two Group Centroids provides a breakpoint for evaluation of group membership. Those cases with discriminant scores less than the breakpoint are classified as one group while those with scores above the breakpoint are classified as a different group.

The specific steps to follow in using discriminant analysis are:

1. (1) Define populations or classifications, such as Accept Group and Reject Group.
2. (2) Specify a set of characteristics which will be used to identify membership in a population.
3. (3) Develop a discriminant model for determining relative weight or importance of each characteristic.
4. (4) Apply model by computing the index score for each observation and selecting a breakpoint score which is used to identify the population into which an observation is assigned.
5. (5) Evaluate model and accept, modify, or reject.

DEFINING GROUP CLASSIFICATIONS

A major problem is defining the classifications of "Accept" and "Reject" groups. Numerous alternatives are available. Groups could be defined in terms of professional status attained ten or 15 years after graduation. Another approach is to classify based on the type of position obtained on graduation as reflected by starting salary, prestige of company, or size of organization. Grade-point average either overall or in business or accounting courses is another possibility. A representative of the Educational Testing Service in Princeton recommended a subjective classification by faculty members. For our model, grade-point average in the last 21 semester hours of accounting courses (GPA AC 21) was selected since employers give substantial weight to this average in entrance-level employment and since this measure allows for "late starters." "Late starters" are students who initially enroll in some other curriculum and subsequently transfer to accounting or those students who are motivated to perform at a higher academic level later in their collegiate careers than they were during their initial semesters. An example is a student who entered the university as a pre-medicine major and who, on encountering academic difficulty in the physical sciences, decided to change to accounting.

The selection of the specific grade-point average above which students are accepted into the program is a function of the primary purpose of the model. We considered two criteria as important in determining the group boundaries: (1) reducing enrollment 20 to 30 percent, and (2) eliminating the poorer students from the program. Our objective, therefore, was to identify those students in the lower percentiles. Accordingly, we considered a GPA AC 21 of 2.3 (based on a four-point system) as the cut-off point in classifying our students. This definition of Accept/Reject Groups would reduce our enrollment by approximately 25 percent and eliminate a group of poorer students.

Other criteria, of course, could be used to set the specific boundaries of group membership. The model user might wish to identify the upper percentiles of the student population or to classify students based on an average grade. While these criteria did not meet our objectives, we will demonstrate how our model can be used to achieve other classification goals.

TIMING OF DECISION

Identification during the last semester of the sophomore year was considered to be optimal in applying the model since students could be notified of the acceptance or rejection of their application to the accounting program prior to preregistration for their junior year. Students not admitted to the accounting program would be able to pursue some other major or course of study, particularly if selected from within the business school, without increasing the total time required to earn a bachelor's degree.

SELECTION OF CHARACTERISTICS

The variables used to classify students into the Accept/Reject Groups are a function of the point in time one wishes to make an admission decision. Numerous characteristics may be appropriate as classification variables but measurement of these variables may not be possible. Depending on the timing of the decision, alternative variables may be available for developing an admission model. For our model, the following seven courses were selected as independent variables based on the timing of our admission decision and because the variables represented subject matter that was identified by Roy and MacNeill [1967] as essential areas of study for accountants.

Accounting Principles, Part I (AC 201)
Economics Principles, Parts I and II (EC 101, EC 102)
College Mathematics (MA 120)
Calculus (MA 121)
English Composition, Parts I and II (EH 101, EH 102)

Seven additional characteristics were selected for inclusion in the model. These characteristics were:

Grade-point average—first 30 semester hours (GPA 30)
Grade-point average—first 45 semester hours (GPA 45)
ACT Composite Score (ACT)
ACT Individual Scores:
  English (ENG)
  Mathematics (MATH)
  Social Studies (SOC)
  Science (SCI)

The American College Testing (ACT) composite and individual scores have been found to be significant predictors of college success as reflected in overall grade-point average [Neely, 1977] as well as for performance in business courses [Price and Kim, 1976]. Brown [1964] discovered a high correlation between college entrance scores and grades in the first two accounting principles courses; however, these were significant only in the outer quintiles.

INTERPRETATION OF MODEL OUTPUT

Two broad criteria were used to judge the effectiveness of our model: model statistics and the proportional chance criterion. For model statistics, we computed the canonical correlation coefficient, Maholonobis' delta square, the latent roots, and the Variance Inflation Factors.

The canonical correlation coefficient, which ranges from zero to one, is used as a measure of the function's ability to discriminate among groups. Maholonobis' delta square is a measure of the distance between group centroids, generally the arithmetic means. The larger the value of delta square, the greater the separation of centroids. This measure can be related to Hotelling's T^2 for statistical tests of significance.

The final measures employed are the analysis of latent roots and Variance Inflation Factors to determine if multicollinearity exists between or among discriminating characteristics or variables. Multicollinearity represents a high degree of interdependence among the independent variables and prevents the model's coefficients from being uniquely determined. If all latent roots are greater than .1, and Variance Inflation Factors (VIF) are less than four, multicollinearity is not considered significant.

The proportional chance criterion can be used to determine *a priori* the probability of an individual case being classified correctly. The probability is computed as:

$$C = X^2 + (1-X)^2,$$

where X is the proportion of cases in Group One and $1-X$ is the proportion of individuals in Group Two. Morrison [1969] suggests that if a discriminant model can perform no better than the proportional chance criterion, the user should disregard the model and classify each case to the larger group.

SELECTION OF DISCRIMINANT MODEL

Using the data described above, a series of models were developed. The base year (1979) graduating class from which data were selected for the models consisted of 80 students, 59 of whom were classified into the acceptance group since they had a grade point average of 2.3 or more on their last 21 semester hours of accounting courses (GPA AC 21).

Model I employed all 14 characteristics or variables and correctly classified 79 percent of the students (see Table 1). The canonical correlation coefficient of .551 indicated an acceptable ability to discriminate. Maholonobis' delta square was found to be significant at a p-value less than .01. The final test applied was that for latent roots. Note in Table 1 that a high degree of multicollinearity exists between GPA 30 and GPA 45 as well as among the ACT composite scores and the individual ACT scores in English, mathematics, social studies, and science. Thus, GPA 30 and ACT were forced out of the model due to multicollinearity.

Model II was developed by removing the two variables, GPA 30 and ACT. The remaining 12 variables used in Model I were included in Model II. Since the variables which were eliminated were not significant in Model I, no major change in analysis and classification statistics occurred other than in the latent roots (see Table 2). The smallest latent root was

TABLE 1
MODEL I

Number of Variables-14

Variables	*F-Value*	*VIF*	$\ell=.003$ V_1	$\ell=.059$ V_2	$\ell=.186$ V_3
GPA 45	22.94	9.17	.010	.656	−.524
EH 102	4.36	1.72	−.001	.032	.273
ENG	.97	17.40	.194	−.002	.266
MA 120	.93	1.69	.019	.009	.157
EC 102	.55	2.21	.009	.073	.081
GPA 30	.37	10.47	−.010	−.734	−.463
AC 201	.21	2.07	−.001	−.061	.374
MA 121	.14	2.59	.001	.076	.339
MATH	.14	25.97	.247	.069	−.010
EH 101	.10	1.76	−.001	.030	.047
SCI	.08	35.02	.290	−.004	−.214
ACT	.08	288.80	−.863	.006	.043
EC 101	.02	1.77	−.016	−.025	−.002
SOC	.02	31.19	.269	−.095	.174

Canonical Correlation-.551
Maholonobis' D-Square-2.196
Approximate $F=2.024$, d.f. 14,65

Prediction Results

Actual Group	*No. Cases*	*Predicted Group Membership* *Group 1*	*Group 2*
Group 1	59	45	14
Accept Group		76%	24%
Group 2	21	3	18
Reject Group		15%	85%

Percent of Grouped Cases Correctly Classified: 79%

.149; therefore, multicollinearity was not considered significant in Model II.

The discriminant function associated with Model II was:

$$D_i = 122.0X_1 - 49.5X_2 + 7.7X_3 + 25.9X_4 + 15.8X_5 + .4X_6 + 30.5X_7 + 2.5X_8 - .3X_9 + 8.8X_{10} - .2X_{11} + 1.7X_{12}$$

where X_1 through X_{12} are the values of the discriminating variables given in the same order as Table 2. An average of the group centroids produced a breakpoint of 738.3.

While both Models I and II correctly classified 79 percent of the observations, a more significant statistic is the correct classification of 85 percent of those in the "reject group." Note that only three of the students who graduated with an accounting grade-point average less than 2.3 were not classified into the reject group during their sophomore year. Thus, application of Model II would result in effectively eliminating the poorer students.

A problem in using Models I or II is the number of variables employed. Students

TABLE 2
MODEL II

Number of Variables-12

Variables	*F-Value*	*VIF*	$\ell=.149$ V_1	$\ell=.211$ V_2	$\ell=.186$ V_3
GPA 45	22.94	4.97	−.819	.051	−.035
EH 102	4.36	1.63	.192	−.250	.097
ENG	.97	2.73	.166	−.489	−.348
MA 120	.93	1.53	.136	.123	−.167
EC 102	.55	2.02	.067	.266	.043
EH 101	.17	1.72	.053	.138	.217
AC 201	.15	2.07	.348	.044	.162
SOC	.10	3.12	.241	.603	.121
SCI	.06	2.57	−.139	−.296	.639
MA 121	.05	2.37	.197	−.355	.043
MATH	.04	2.38	−.033	.078	−.564
EC 101	.02	1.67	.029	−.020	−.149

Canonical Correlation-.546
Maholonobis' D-Square-2.024
Approximate $F=2.369$, d.f. 12,67

Prediction Results

		Predicted Group Membership	
Actual Group	*No. Cases*	*Group 1*	*Group 2*
Group 1	59	45	14
Accept Group		76%	24%
Group 2	21	3	18
Reject Group		15%	85%

Percent of Grouped Cases Correctly Classified: 79%

may not readily accept or appreciate an admission policy with 12 or 14 variables and related coefficients or weights. To overcome this problem, an abbreviated model was considered using only three variables. The variables selected were those having the highest F or discriminating value in Model II using a step-wise analysis procedure.

The model selected for use, Model III, was based on three variables: grade-point average at 45 semester hours (GPA 45); grade in English Composition, Part II (EH 102); and grade in college mathematics (MA 120). The mathematics variable was selected over the ACT English variable even though this latter measure had a slightly higher F-value. We chose the mathematics variable because of the importance given to this subject area in an accounting curriculum (see Roy & MacNeill [1967, p. 17]).

Model III correctly classifies 78 percent of the observations, only one percent less than with Models I and II. More significantly, 90 percent of those in the rejection group were identified during their sophomore year. Such identification virtually guarantees the eliminating of the poorer performing students early in their academic programs. The overall predictive ability of the model compares favorably

TABLE 3
MODEL III

Number of Variables-3

Variables	*F-Value*	*VIF*	$\ell=.394$ V_1	$\ell=.833$ V_2	$\ell=1.77$ V_3
GPA 45	22.94	1.67	−.748	.034	.663
EH 102	4.36	1.36	.517	.656	.550
MA 120	.62	1.27	.417	−.754	.509

Canonical Correlation-.524
Maholonobis' D-Square-1.907
Approximate $F=9.589$, d.f. 3,76

Prediction Results

		Predicted Group Membership	
Actual Group	*No. Cases*	*Group 1*	*Group 2*
Group 1 Accept Group	59	43 73%	16 27%
Group 2 Reject Group	21	2 10%	19 90%

Percent of Grouped Cases Correctly Classified: 78%

with discriminant models used in other research situations and with regression models employed in studying admission policies. The model also outperformed the proportional chance criterion (chance probability of .61).

The discriminant function specified by Model III was:

$$D_i=326.8X_1+43.3X_2-118.2X_3$$

where X_1 is the variable GPA 45, X_2 is MA 120, and X_3 represents EH 102. Group centroids were 342.6 and 587.0 for the Reject and Accept groups, respectively. An average of these centroids produced a breakpoint of 464.8.

In analyzing Model III, the .524 canonical correlation coefficient was not significantly lower than Model II. Maholonobis' delta square of 1.907 indicates that the discriminant function is capable of separating the observations into two separate groups or classifications. Table 3 contains the latent roots, the smallest of which is .394. Therefore, multicollinearity is not considered to be significant in Model III.

A potential problem in using Model III is the incorrect classification of 27 percent of those students in the accept group. Using this model, 16 of the 59 students who graduated with over a 2.3 grade-point average on the last 21 hours of accounting would have been eliminated at the sophomore level. A study of those eliminated revealed that 93 percent of those incorrectly excluded had a very low grade-point average at 45 semester hours but made an A or B in accounting principles and college mathematics. Their low grade-point average generally was the result of poor grades in courses not required of accounting majors and was due to the fact that most of these students initially had majored in pre-medicine, engineering, or one of the physical

TABLE 4
VALIDATION OF MODEL

Actual Group	No. Cases	Predicted Group Membership: Group 1	Predicted Group Membership: Group 2
Group 1 Accept Group	44	35 80%	9 20%
Group 2 Reject Group	12	2 17%	10 83%

Percent of Grouped Cases Correctly Classified: 80%

sciences. By providing for an appeal and review procedure, the detail records of those eliminated by the model could be studied with a view towards conditional admittance to the accounting program. If the student made satisfactory grades in intermediate, cost, and tax accounting, unconditional admission could be extended. Such a procedure would adjust for the incorrect classification of the accept group by Model III.

One of the advantages of using MDA is the flexibility it provides the user in selecting the number of model variables. While we consider Model III to be optimal, other users may prefer Model II employing 12 variables, while others may find that a two-variable model provides sufficient accuracy for their needs. For example, Model III could be reduced to two variables without a significant loss in classification accuracy. Such a model would produce a discriminant function of:

$$D_i = 198.5X_1 - 60.2X_2$$

where X_1 represents GPA 45 and X_2 represents EH 102. The breakpoint for this abbreviated model is 212.2 and has an overall classification accuracy of 74 percent.

VALIDATION OF MODEL

To evaluate the reliability of discriminant analysis in implementing an admission policy, Model III was applied to the spring graduation class of the subsequent year. That class consisted of 56 accounting majors, 44 of whom had a grade-point average of 2.3 or more on their last 21 semester hours of accounting. The discriminant model correctly classified 80 percent of the students. Only two of the 12 in the reject group were not identified at the sophomore level, while 80 percent of the accept group were correctly identified, as is shown in Table 4.

OTHER CLASSIFICATION CRITERIA

The discriminant model presented in this paper was developed to achieve certain goals, namely those of reducing total enrollment and eliminating the poorer students. Other schools could have different objectives for using a discriminant model, such as targeting the upper percentile of students for enrollment in honors courses or to set group boundaries at other specific grade-point averages. Table 5 is provided to demonstrate the ability of our model to achieve other objectives. Specifically, we varied the level of the classification variable, GPA AC 21, to determine the discriminating power of the model in meeting different objectives. Three levels selected for the classification variable were 3.3, 3.0, and 2.8.

TABLE 5

CLASSIFICATION RESULTS FOR VARIOUS BREAKPOINTS

Actual Group	No. Cases	Predicted Group Membership: Group 1	Predicted Group Membership: Group 2
GPA AC=3.3			
Group 1 Accept Group	20	18 90%	2 10%
Group 2 Reject Group	60	20 33%	40 67%
Percent of Grouped Cases Correctly Classified: 73%			
GPA AC=3.0			
Group 1 Accept Group	27	24 89%	3 11%
Group 2 Reject Group	53	14 26%	39 74%
Percent of Grouped Cases Correctly Classified: 79%			
GPA AC=2.8			
Group 1 Accept Group	38	31 82%	7 18%
Group 2 Reject Group	42	9 21%	33 79%
Percent of Grouped Cases Correctly Classified: 80%			

These three additional models continue to do a good job in classifying the students into two groups. Of particular interest is a comparison of the model based on a 3.3 grade-point average and our original model using a 2.3 grade-point average for GPA AC 21. The two models produce similar classification results but for breakpoints set at opposite ends of the grade-point scale. Analysis of all the models presented indicates that the discriminant models do a better job in identifying extreme ends of the grade-point scale than in classifying students at some mid-point range. We expect, however, that this is exactly what school administrators would prefer. These results are consistent with the findings of Brown [1964] in correlating entrance scores and accounting course grades.

SUMMARY

A major problem exists since accounting enrollments continue to increase at a time of limited resources of accounting faculty, physical facilities, and funds. One viable solution is that of restricting admission to accounting programs to students with a high probability of attaining academic standards. Discriminant analysis provides a statistically sound technique for identifying such students as early as the sophomore year. Based on our research definition of Accept/Reject Groups, the model presented in this paper correctly classified the students with an accuracy of approximately 80 percent, relying on only three characteristics—grade-point average at 45 semester hours, grade in college mathematics, and grade in English composition. When coupled with an appeal and review process, and a conditional admission policy, accounting faculty are able to identify those students with an acceptable achievement level and eliminate those who would not excel in accounting courses at a point early in their academic programs. The result should be better use of available resources and an improved accounting student body.

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1983 Survey of Doctoral Programs in Accounting in the United States and Canada

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ABSTRACT: This paper reports the results of a sixth triennial canvass covering 74 doctoral programs in the United States. For the first time, six Canadian doctoral programs are included. Data are provided on universities offering doctoral degrees, degrees awarded between 1980 and 1982, candidates in coursework stage, and candidates in dissertation stage. Canadian statistics, presented in a separate section, indicate a small but growing number of candidates and graduates. Doctoral degrees granted in the three-year period by United States universities increased in each year, reaching an all-time high of 177 in 1982. Offsetting this is a forecasted decrease in graduates for 1983 and 1984. Enrollments of candidates at the dissertation stage declined by 6.4 percent since the 1980 survey. Candidates at the coursework stage declined by 4.4 percent. The national three-year doctoral output has remained in the range of 424 to 469 since 1971.

THIS survey updates five previous surveys [Crum, 1969, 1971, 1974, 1978, 1981]. Coverage has been extended to include Canadian as well as U.S. universities. Data may be considered correct as of April 1983, although some responses were received as late as October 1983.

In 1983, 74 U.S. universities offered doctoral programs in accounting, compared to 72 in 1980. The increase represents the elimination of one program, Lehigh, and the addition of three universities, Carnegie-Mellon and Massachusetts Institute of Technology, which were not included in the 1980 study, and Southern Illinois University at Carbondale, which began offering accounting doctorates in 1980. Six Canadian universities also offer doctorates in accounting. Aggregated Canadian statistics are presented in a separate section. The appendix contains statistics for each individual U.S. and Canadian university included in the study.

We believe that we have included all universities granting doctorates in accounting in the U.S. The list of doctoral-granting universities from the 1980 survey was updated as new facts came to our attention. We also used *Accounting Faculty Directory* [Hasselback, 1982], *Doctoral Programs in Accounting* [Campbell and Hermanson, 1980], and *University Accounting Programs in Canada: Inventory and Analysis* [Beechy,

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TABLE 1

UNITED STATES UNIVERSITIES OFFERING ACCOUNTING DOCTORAL DEGREES

	Survey					
Schools Offering:	*1983*	*1980*	*1977*	*1974*	*1971*	*1969*
Ph.D. program only	59	56	52	46	39	31
DBA program only	13	14	14	12	12	8
Both Ph.D. and DBA	2	2	3	5	5	5
Totals	74	72	69	63	56	44

1980, pp. 153–154]. Follow-ups by mail and telephone were used until responses were received from all schools included on our lists.

As shown in Table 1, of the 74 U.S. universities offering doctoral degree programs permitting a major or emphasis in accounting, 59 offer the Ph.D. degree, 13 offer the DBA degree, and two schools offer both. Table 2 shows that 469 degrees were awarded by U.S. universities during 1980–82, which is the highest triennium total recorded since this series of reports began.

During the 1980–1982 period, there were eight schools which had no doctoral graduates, seven schools which produced one doctorate each, and three schools which produced two doctorates each. At the other end of the spectrum, 20 schools each produced nine or more doctorates during the three-year period.

Table 3 contains the total number of doctoral candidates from the current and past five surveys. The total number of students in doctoral programs has declined by 5.6 percent since the 1980 survey. Students in the coursework stage declined by 6.4 percent, while those in the dissertation phase declined by 4.4 percent.

Seventeen universities indicated that they had 15 or more candidates in the coursework stage in 1983, compared to 11 in 1980. The present list includes:

Illinois, Urbana-Champaign	34
Texas, Austin	32
Wisconsin, Madison	27
North Texas State	25
New York University	22
City University New York	20
Washington	18
Louisiana State	18
Nebraska	16
Kentucky	16
Houston	16
Florida	16
Arizona State	16
Pennsylvania State	15
Mississippi	15
Michigan	15
Georgia State	15

Total candidates in progress at these 17 universities were 336, or 50 percent of all candidates in coursework. Twelve universities now have ten or more candidates at the dissertation stage:

Kentucky	22
Illinois, Urbana-Champaign	19
Missouri, Columbia	18
Texas, Austin	17
Pennsylvania State	16
George Washington	16
New York	13
Arkansas	12
Wisconsin, Madison	11
Southern California	11
Georgia State	11
North Texas State	10

The 176 candidates in dissertation work

TABLE 2
DOCTORAL DEGREES GRANTED

(a) Degrees by Year

Year	*Degrees Granted*	*Change From Previous Year*
1977	140	+9.4%
1978	166	+18.6%
1979	130	−21.7%
1980	142	+9.2%
1981	150	+5.6%
1982	177	+18.0%

(b) Degrees by Triennium

Triennium	*Degrees Granted*	*Change From Previous Triennium*
1968–1970	350	
1971–1973	433	+23.7%
1974–1976	424	−2.1%
1977–1979	436	+2.8%
1980–1982	469	+7.6%

at these 12 universities amount to 40 percent of all candidates in the dissertation stage.

FORECASTS OF 1983 AND 1984 GRADUATES

University officials were asked to forecast the number of graduates from their programs for 1983 and 1984. Table 4 contains forecasts made every three years from 1967 to 1979 compared with totals subsequently graduated in the forecasted years. The forecasting accuracy has been relatively consistent over the series of studies. The percentage of forecasted to actual graduates has declined from 1975, when it was 70 percent, to 63 percent in both 1980 and 1981. The 1980 survey projected that, after applying an historical adjustment for overly-optimistic estimates of roughly 31 percent, 155 degrees would be granted in 1980 and 165 in 1981. Degrees actually awarded were 142 in 1980 and 150 in 1981.

If we accept a completion rate of 66 percent as being most likely to occur in the coming two years, the probable numbers of degrees which will be granted are:

	Number of Doctorates to be Granted	
	Total Forecasts by Respondents	*Probable Total After Adjustment*
In 1983	211	139
In 1984	242	160

Though there was an increase of 33 degrees granted in 1980–82 over the 1977–79 total, the number of candidates in both the coursework and dissertation stages decreased. The forecasted annual doctoral graduates in both 1983 and 1984 are below the number graduated in 1982.

As in previous surveys, respondents also were asked whether interest in doctoral programs in accounting is declining, increasing, or unchanged from that of a few years back. Eleven universities reported declining interest, 30 universities increasing interest, 23 universities unchanged, and ten universities gave no

TABLE 3

CANDIDATES WORKING ON DOCTORAL DEGREES

Candidates in:	*As of 1983*	*As of 1980*	*As of 1977*	*As of 1974*	*As of 1971*	*As of 1969*
Coursework Stage	670	716	609	522	569	590
Dissertation Stage	435	455	386	343	337	257
Totals	1105	1171	995	865	906	847

TABLE 4

COMPARISON OF PREVIOUS FORECASTS WITH DOCTORAL DEGREES GRANTED

Degrees:	*1981*	*1980*	*1978*	*1977*	*1975*	*1974*	*1972*	*1971*	*1969*	*1968*
Forecast	239	225	253	206	221	211	237	209	196	128
Actually Granted	150	142	166	140	154	142	141	145	114	92
Granted as a Percentage of Forecast	63%	63%	66%	68%	70%	67%	59%	69%	58%	72%

opinion. This compares to 13 who indicated declining interest and 16 who indicated increasing interest in 1980.

FACULTIES OF DOCTORAL-GRANTING UNIVERSITIES

Sixty-eight schools responded to our request to provide information about the number of their accounting faculty who hold doctorates. Ninety-three percent of their doctorally qualified faculty members (975 of 1,043) hold doctorates with a major or concentration in accounting. Of the remaining, doctorates held were in the following areas:

Economics	27
Finance	7
Operations Management/Operations Research	6
Systems and Computers	6
Law	5
Management Science	4
Business Administration—Other Disciplines	7
Philosophy	2
Education	1
Mathematics	1
Political Science	1
Soil Science	1
Total Non-Accounting Doctorates	68

This question was included in the survey to examine the allegations of a few critics that "too many of our accounting faculty have doctorates in economics, statistics, or other fields." By including only holders of the Ph.D. and the DBA, we excluded those possessing the Ed.D. degree which is held by some teaching in the accounting field. No criticism is implied herein towards those having other doctorates. Many of those individuals have undergraduate or master's work in accounting and possess the CPA or other professional certification.

CANADIAN DOCTORAL-GRANTING UNIVERSITIES

Six Canadian universities responded to

our request for information. All offered the Ph.D. (rather than DBA) degree. Their output of doctorates totaled three in 1981 and two in 1982. They projected two graduates for 1983 and seven for 1984. There were 15 candidates at the coursework stage and nine at the dissertation stage. Three of the six reported increasing interest in accounting doctoral programs while three indicated no change. In the six universities, 28 faculty hold accounting doctorates and six hold doctorates in the following areas:

Management Information Systems	3
Economics	1
Operations Research	1
Quantitative Methods	1

APPENDIX A

SURVEY OF DOCTORAL PROGRAMS IN ACCOUNTING—1983

University	Degree	Degrees Granted			Estimate For		Candidates	
		1980	1981	1982	1983	1984	Course Work	Dis. Phase
Alabama	Ph.D.	1	3	1	6	3	12	8
Arizona	Ph.D.	2	4	2	2	1	11	1
Arizona State University	D.B.A.	3	1	3	2	4	16	7
Arkansas	Ph.D.	7	3	8	12	6	5	12
Boston University	D.B.A.	0	0	0	0	3	13	3
California, Berkeley	Ph.D.	1	1	1	3	4	7	7
California, Los Angeles	Ph.D.	0	0	3	1	4	3	6
Carnegie-Mellon University	Ph.D.	1	2	0	1	0	0	1
Case Western Reserve University	Ph.D.	0	0	1	0	1	2	1
Chicago	Ph.D.	*	*	*	3	4	8	4
Cincinnati	Ph.D.	2	1	2	2	3	3	5
City University New York	Ph.D.	2	1	1	1	3	20	5
Colorado, Boulder	D.B.A.	2	2	3	3	3	8	6
Columbia University	Ph.D.	0	0	2	3	5	5	8
Cornell University	Ph.D.	1	1	1	2	2	3	2
Duke University	Ph.D.	0	0	0	0	1	1	0
Florida	Ph.D.	1	3	3	3	5	16	7
Florida State University	D.B.A.	2	1	2	0	3	5	5
George Washington University	D.B.A.	3	2	0	4	6	5	16
Georgia	Ph.D.	4	2	10	3	5	10	3
Georgia State University	Ph.D.	2	7	3	5	4	15	11
Harvard University	D.B.A.	0	0	1	2	1	1	2
Houston	Ph.D.	3	4	2	3	4	16	5
Illinois, Urbana-Champaign	Ph.D.	1	9	13	11	10	34	19
Indiana University	Both	2	1	4	7	5	10	9
Iowa	Ph.D.	2	3	1	2	1	11	4
Kansas	Ph.D.	0	3	0	1	2	6	3
Kent State University	D.B.A.	0	0	0	3	5	9	6
Kentucky	D.B.A.	5	1	3	10	8	16	22
Louisiana State University	Ph.D.	4	1	7	3	3	18	8
Louisiana Technical University	D.B.A.	2	3	3	3	4	5	3
Maryland, College Park	Ph.D.	0	2	3	2	1	7	3
Massachusetts	Ph.D.	0	5	1	0	2	4	3
Massachusetts Institute of Technology	Ph.D.	0	0	1	0	0	0	0
Miami	Ph.D.	0	0	0	0	1	1	0
Michigan	Ph.D.	3	2	4	4	4	15	5
Michigan State University	Ph.D.	2	2	6	5	6	12	8
Minnesota	Ph.D.	1	2	1	3	3	7	7
Mississippi	Ph.D.	1	3	2	2	*	15	4

APPENDIX A—*(Continued)*

		Degrees Granted			*Estimated For*		*Candidates*	
University	*Degree*	*1980*	*1981*	*1982*	*1983*	*1984*	*Course Work*	*Dis. Phase*
Mississippi State	D.B.A.	3	2	2	3	3	8	6
Missouri, Columbia	Ph.D.	13	10	3	7	4	8	18
Nebraska	Ph.D.	1	3	6	4	6	16	6
New York University	Ph.D.	0	2	3	3	3	22	13
North Carolina, Chapel Hill	Ph.D.	4	2	3	2	3	8	7
North Texas State University	Ph.D.	5	4	5	4	5	25	10
Northwestern University	Ph.D.	2	2	2	1	1	3	3
Ohio State University	Ph.D.	4	5	3	6	3	9	4
Oklahoma	Ph.D.	1	1	4	4	1	4	5
Oklahoma State University	Ph.D.	8	4	5	5	4	7	7
Oregon	Ph.D.	1	4	1	2	3	5	5
Pennsylvania	Ph.D.	0	0	1	0	1	3	0
Pennsylvania State University	Ph.D.	4	4	5	5	11	15	16
Pittsburgh	Ph.D.	0	0	1	2	4	6	8
Purdue University	Ph.D.	0	1	0	0	1	2	1
Rice University	Ph.D.	0	0	0	0	0	0	0
Rochester	Ph.D.	3	1	0	2	0	5	1
Saint Louis University	Ph.D.	1	1	4	3	5	9	7
Santa Clara	Ph.D.	0	0	0	0	1	0	4
South Carolina	Ph.D.	0	5	2	3	3	10	5
Southern California	Ph.D.	3	2	0	5	6	12	11
Southern Illinois University	D.B.A.	0	0	0	0	1	3	1
Stanford University	Ph.D.	2	2	1	0	4	5	6
State University of New York, Buffalo	Ph.D.	0	0	2	1	1	6	5
Syracuse University	Ph.D.	0	1	2	1	2	5	4
Tennessee, Knoxville	D.B.A.	5	4	5	3	3	8	1
Texas A & M University	Ph.D.	0	0	0	4	3	12	4
Texas, Arlington	Ph.D.	1	0	0	1	*	0	1
Texas, Austin	Ph.D.	7	4	4	9	9	32	17
Texas Technical University	D.B.A.	1	3	3	2	4	6	5
Utah	Ph.D.	0	0	2	1	2	4	2
Virginia Polytechnic Institute	Ph.D.	3	1	5	3	5	10	6
Washington	Ph.D.	6	3	1	2	4	18	5
Washington University, St. Louis	Both	2	2	2	1	0	2	1
Wisconsin, Madison	Ph.D.	2	2	2	5	6	27	11
Canadian Universities								
British Columbia	Ph.D.	1	1	0	2	2	4	3
Ecole des Hautes Etudes Commerciales	Ph.D.	0	0	0	0	0	1	0
McGill University	Ph.D.	0	0	0	0	1	2	1
Queen's University	Ph.D.	0	0	0	0	2	3	2
Simon Fraser University	Ph.D.	0	1	0	0	1	3	1
Western Ontario	Ph.D.	0	1	2	0	1	2	2

* = no response

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Convertible Securities and Earnings Per Share: A Competitive Ranking Algorithm

Bob Kilpatrick, Karl Putnam and Harold Schneider

ABSTRACT: This note explains a modified shortcut approach for computing earnings per share when convertible securities are present. In many cases, it can decrease the number of calculations involved when compared to a widely used shortcut procedure.

An important aspect of computing earnings per share (EPS) is the process of determining which convertible securities (bonds and preferred stock) are dilutive and which are anti-dilutive. The assumed conversion of dilutive securities reduces EPS (or increases a loss per share). Conversely, the assumed conversion of anti-dilutive securities increases EPS (or decreases a loss per share). Accounting Principles Board (APB) Opinion 15 [1969] requires that the reported EPS must be the smallest value resulting from the assumed conversion of all possible combinations of convertible securities. Accordingly, anti-dilutive securities are assumed not converted when calculating EPS.

When a company has several convertible securities outstanding, the determination of a security's dilutive or anti-dilutive effect on the EPS figure depends upon the sequence that the securities are entered into the EPS formula. Checking all the various combinations in which n securities are present would involve 2^n calculations in order to determine the combination which yields the lowest figure for EPS.

Davidson and Weil [1975] have developed a shortcut procedure for computing EPS which reduces the number of required calculations from 2^n to a maximum of n. This shortcut is a building process in which dilutive securities are ordered and added one at a time to the EPS formula. Their procedure involves a comparison of this sequentially computed EPS with "the charge against net income per common share embodied in a potentially dilutive convertible security" [p. 46]. If the charge against net income is less than the EPS, the security is dilutive and conversion is assumed. If the charge against net income is greater than or equal to the EPS, the security is anti-dilutive—conversion is not assumed.

The acceptance of the Davidson/Weil shortcut is relatively widespread, as

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evidenced by its inclusion in several Intermediate Accounting textbooks (see e.g., Chasteen, Flaherty and O'Connor [1984, Ch. 24], Nikolai, et al. [1983, Ch. 18], and Kieso and Weygandt [1983, Ch. 17]). However, a modification of this shortcut exists which, in many cases, can reduce the number of calculations required in the Davidson/Weil approach. The remainder of this paper describes the steps involved in this modified approach and illustrates the calculations with an example.

THE MODIFIED SHORTCUT PROCEDURE

The flowchart in Figure 1 shows that this modified shortcut procedure takes the opposite approach from the Davidson/Weil method.[1] Rather than adding dilutive securities to the EPS formula one at a time (as in the Davidson/Weil technique), this approach includes all initially dilutive securities and eliminates those which subsequently are determined to be anti-dilutive. The steps required in this modified approach follow:

1. Compute the initial EPS (including the assumed conversion of all dilutive options and warrants):

$$\text{EPS} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Weighted Average Common Shares}}$$

2. For each convertible security, compute the change in the EPS formula (ΔEPS):

$$\Delta\text{EPS} = \frac{\text{Preferred Dividends or Interest Expense (net of tax)}}{\text{Number of common shares issuable upon conversion}}$$

3. Compute an all-converted EPS, assuming conversion of all initially dilutive convertible securities. (Initially dilutive means that the ΔEPS for a security is less than the initial EPS computed in Step 1. Any securities which are not initially dilutive are eliminated immediately.)
4. Compare every remaining ΔEPS to the most recent EPS calculated.
   a. If each remaining ΔEPS is less than the newest EPS, every convertible security is dilutive. Conversion is assumed for all of the securities, and the last EPS calculated is reported as the EPS figure.
   b. If any ΔEPS are greater than or equal to the newest EPS, these securities should be eliminated because they are anti-dilutive. (Note that more than one security may be eliminated simultaneously.) Compute a new EPS with the securities which have not been eliminated.
5. Repeat Step 4 until every ΔEPS remaining in the EPS calculation is less than the last EPS computed.

ILLUSTRATION

The assumptions for an illustration of this modified shortcut procedure are presented in Figure 2. The calculations, discussed below, are presented in Figure 3. For simplicity, it is assumed that the fully diluted earnings per share figure is being calculated.

In Step 1, the initial EPS of $6.00 is calculated. The ΔEPS are computed in Step 2. Note that each of the securities is initially dilutive (i.e., less than the initial EPS). Because all of the securities are initially dilutive, conversion is assumed for every security, and the all-converted $4.83 EPS is calculated. Security B then is eliminated because its ΔEPS of $5.50 is greater than $4.83. A new all-converted

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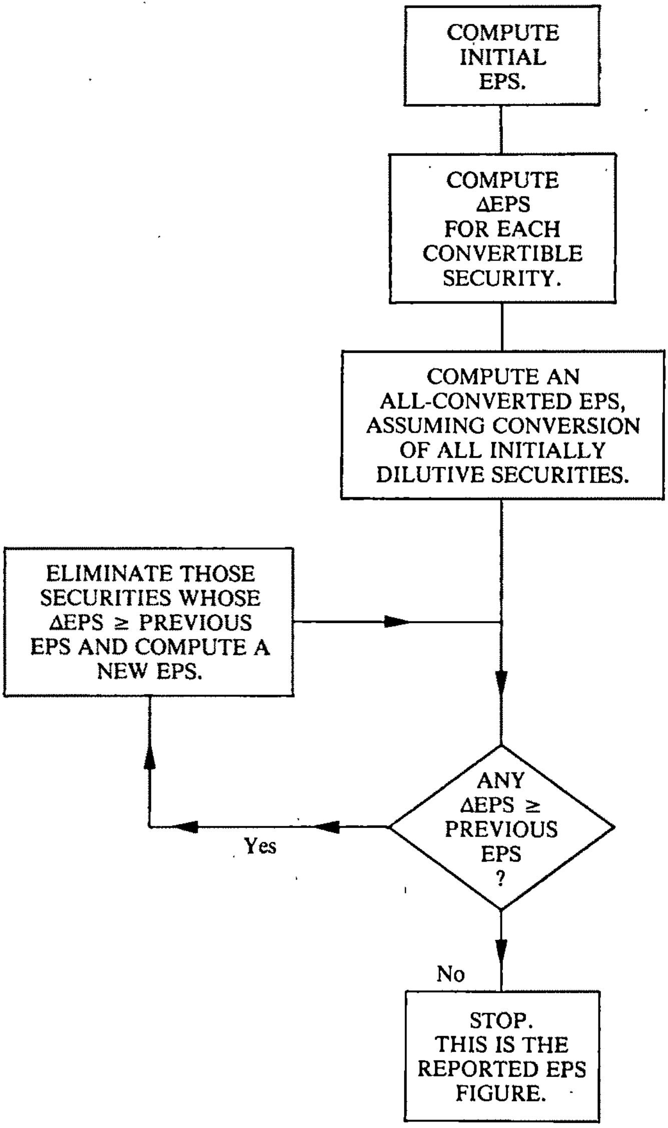
[1] See Matulich, Nikolai and Olson [1977] for a flowchart depiction of EPS which incorporates the Davidson/Weil shortcut procedure.

FIGURE 1

FLOWCHART OF THE MODIFIED SHORTCUT PROCEDURE


COMPUTE INITIAL EPS.
COMPUTE ΔEPS FOR EACH CONVERTIBLE SECURITY.
COMPUTE AN ALL-CONVERTED EPS, ASSUMING CONVERSION OF ALL INITIALLY DILUTIVE SECURITIES.
ELIMINATE THOSE SECURITIES WHOSE ΔEPS ≥ PREVIOUS EPS AND COMPUTE A NEW EPS.
ANY ΔEPS ≥ PREVIOUS EPS ?
Yes
No
STOP. THIS IS THE REPORTED EPS FIGURE.

EPS of $4.80 is calculated with the remaining securities. Since there are no other securities to eliminate, the last EPS figure of $4.80 is reported as fully diluted EPS.

SUMMARY AND CONCLUSIONS

The above illustration demonstrates the substantial time savings inherent in the shortcut procedures. If one were to

FIGURE 2
ILLUSTRATION

Net Income	$214,500
—Dividends on Preferred Stock	−34,500
Earnings to Common Shareholders	$180,000
Common Shares Outstanding (Weighted Average)	30,000

Convertible Securities Outstanding

Security	*Description*	*Total Dividends or Interest (Net of 40% Tax)*	*Total Common Shares From Assumed Conversion*
A	9% Preferred Stock, $50 Par, 3,000 shares. Each share converts into one share of Common Stock.	$13,500	3,000
B	11% Preferred Stock, $100 Par, 1,000 shares. Each share converts into two shares of Common Stock.	$11,000	2,000
C	10% Preferred Stock, $20 Par, 5,000 shares. Each share converts into one share of Common Stock.	$10,000	5,000
D	10% Convertible Bonds, $200,000 Face Value. Each $1,000 bond converts into 20 shares of Common Stock.	$12,000	4,000
E	10% Convertible Bonds, $250,000 Face Value. Each $1,000 bond converts into 24 shares of Common Stock.	$15,000	6,000

check all possible combinations of the five securities, 32 (that is, 2^5) calculations would be required. To obtain the $4.80 EPS figure, four calculations would be required under the Davidson/Weil shortcut procedure. The modified shortcut approach presented in this paper required only two calculations. As further evidence of the usefulness of the modified shortcut procedure, consider Davidson and Weil's illustration [1975, p. 47, Table 2]. The modified shortcut technique requires one less calculation than their method.

There are instances in which the Davidson/Weil approach requires fewer calculations than this modified shortcut. The following guidelines have been formulated to determine which method would be superior in a given situation. The point of decision as to whether to use Davidson/Weil or the modified shortcut method is after the initial EPS and ΔEPS for each convertible security have been calcu-

FIGURE 3

EPS CALCULATION

Step 1: $\text{EPS} = \dfrac{\$180{,}000}{30{,}000 \text{ sh.}} = \$6.00$ per share

Step 2: ΔEPS for each convertible security:

A: \$13,500/3,000 sh. = \$4.50 per share
B: \$11,000/2,000 sh. = \$5.50 per share
C: \$10,000/5,000 sh. = \$2.00 per share
D: \$12,000/4,000 sh. = \$3.00 per share
E: \$15,000/6,000 sh. = \$2.50 per share

Step 3: EPS assuming conversion of all initially dilutive convertible securities:

$$\frac{\$180{,}000+\$13{,}500+\$11{,}000+\$10{,}000+\$12{,}000+\$15{,}000}{30{,}000+3{,}000+2{,}000+5{,}000+4{,}000+6{,}000}=\$4.83$$

Step 4: Security B is eliminated because its ΔEPS of \$5.50 > EPS of \$4.83.

Step 5: EPS is recalculated assuming conversion of all securities except Security B:

$$\frac{\$180{,}000+\$13{,}500+\$10{,}000+\$12{,}000+\$15{,}000}{30{,}000+3{,}000+5{,}000+4{,}000+6{,}000}=\$4.80$$

All ΔEPS in the EPS calculation < \$4.80. Therefore EPS cannot be lowered further, and is reported as \$4.80.

lated. If the ΔEPS are congregated just below the initial EPS with a few highly dilutive outliers, the Davidson/Weil method is more efficient. On the other hand, if the ΔEPS are bunched in a highly dilutive group with a few outliers just below initial EPS, the modified shortcut proves superior.

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FINANCIAL REPORTING

Clyde P. Stickney, Editor

Aetna, The SEC and Tax Benefits of Loss Carryforwards

John A. Elliott and Robert J. Swieringa

ABSTRACT: This article discusses several issues underlying a dispute between Aetna and the SEC about accounting for the tax benefits of loss carryforwards. We discuss current accounting requirements for these benefits, Aetna's accounting for its tax benefits, and the reaction of security markets to its dispute with the SEC. We believe that accounting for these tax benefits should be changed to reflect changes in the tax laws, current definitions of assets, and criteria for accounting recognition.

AETNA Life & Casualty Company, the largest stockholder-owned insurance company in the United States, disclosed in its 1982 annual report that the company's accounting for future tax benefits in 1982 was under formal investigation by the Securities and Exchange Commission (SEC). The dispute centered on the accounting recognition of tax losses which may lead to expected tax benefits in the future. These benefits provided $203 million, or 39 percent, of Aetna's 1982 operating profit of $522 million. The SEC believed that Aetna could not be assured of being able to use the tax-loss benefits "beyond any reasonable doubt." Aetna and its auditors, Peat, Marwick, Mitchell & Co., believed that it had met this test. The SEC began its formal investigation in March 1983. In July 1983, Aetna announced that it had decided to restate its 1982 financial results to eliminate the tax benefits questioned by the SEC. In a prepared statement, Aetna stated that "we have now concluded that it no longer serves any useful purpose to remain in a continuing, expensive and distractive controversy with the SEC and have agreed in settlement with the SEC to restate our 1982 financial results."[1]

This article explores several of the issues involved in the dispute between

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[1] "Aetna Restates Results for All of '82, Ending Tax Dispute with SEC," *The Wall Street Journal*, Friday, July 8, 1983.

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Aetna and the SEC. Tax-loss carryforwards provide economic benefits in future periods of taxable income.[2] The next section discusses accounting for the tax benefits of loss carryforwards under current generally accepted accounting principles. The interpretation of these principles, as specified in APB *Opinion No. 11* [APB, 1967], created the conflict between the SEC and Aetna.

We also examine and evaluate Aetna's accounting for its tax benefits and the performance of its share price during this period. A negative relative performance of Aetna's share price is identified in general over the period, significant portions of which are associated with specific references to the accounting controversy in the financial press. We do not believe that Aetna's share price was devalued because of a change in accounting for an unchanging, underlying economic reality. Rather, we believe that the underlying economic reality itself was changing. We use a simple decision rule and Aetna's public statements to describe how the cycle associated with profitable underwriting in property and casualty insurance appears to have changed such that underwriting losses were greater than before and persisted longer. This change is important in deciding how to account for the uncertain benefits of tax-loss carryforwards.

We conclude with some suggestions for improving accounting for tax benefits of loss carryforwards.

TAX-LOSS CARRYFORWARDS

Operating losses for tax purposes (e.g., deductions exceed gross income) arising in one period may be carried back three years to generate refunds of taxes paid in those years and/or carried forward for up to 15 years, providing deductions from taxable income in those subsequent years. Generally accepted accounting principles require that the tax effects of any realized operating loss carrybacks be recognized in the determination of net income of the loss periods, since the refund "is both measurable and currently realizable" [APB, 1967].

When a tax-loss is carried forward, the future benefits are neither certain nor objectively measurable. Generally accepted accounting principles require that the future tax benefits due to loss carryforwards be recognized in the determination of net income in the period in which they are realized, "except in unusual circumstances when realization is assured beyond any reasonable doubt at the time the loss carryforwards arise" [APB, 1967]. Future recognition of tax-loss carryforward benefits should be reported as extraordinary items.

The Accounting Principles Board (APB) apparently believed that, in accounting for the tax benefits of loss carryforwards, a strict interpretation of the realization concept should take precedence over the matching concept [AICPA, 1974]. The matching concept suggests that these benefits should be recognized in the period the losses arise. The benefits are generated in the loss periods and ideally should be matched with (reduce) these losses. Otherwise, the losses are overstated and a potentially important asset (the ability to reduce taxes) is not recorded. The realization concept suggests that these benefits should be recognized only in the later period in which they are received, because realization of these benefits is uncertain. Such conflict between recognition and realization has affected the development of generally accepted accounting principles for many years [Horngren, 1965].

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[2] Insurance companies are covered by unique tax provisions. They can affect their tax status by the structure and timing of loss settlements and by investment strategies. Recent changes in the industry have led to unprofitable underwriting activity offset by (perhaps) profitable portfolio management. The taxability of portfolio gains is controllable by the composition of the portfolio and the timing of trades.

APB *Opinion No. 11* [APB, 1967] provides "that the future tax benefit of a loss carryforward should be recognized as an asset during the loss period if realization is 'assured beyond any reasonable doubt.'" It was the APB's intention that such recognition should be restricted to unusual cases. APB *Opinion No. 11* [APB, 1967] states that "in those rare cases in which realization of the tax benefits of loss carryforwards is assured beyond any reasonable doubt, the potential benefits should be associated with the periods of loss and should be recognized in the determination of results of operations for those periods." Realization was considered to be assured beyond any reasonable doubt when both of the following conditions existed: (a) the loss resulted from an identifiable, isolated, and nonrecurring cause and the company either had been continuously profitable over a long period or had suffered occasional losses which were more than offset by taxable income in subsequent years; and (b) future taxable income was virtually certain to be large enough to offset the loss carryforward and would occur soon enough to provide realization during the carryforward period [APB, 1967].

The use of the words "identifiable, isolated, and nonrecurring" in the above quotation was intended to rule out recognition of loss carryforwards resulting from generally unsuccessful business operations of an entity [AICPA, 1974]. Operating losses resulting because of depressed economic conditions or because of changes in consumer preferences or in technology would not give rise to a situation where a future tax benefit might be recognized currently. Loss carryforwards resulting from the introduction of products or services which had not achieved sufficient acceptance to produce profits also would not qualify for recognition prior to realization [AICPA, 1974].

Two examples of loss carryforwards that might qualify for recognition during the loss period are (a) losses resulting from the expropriation of a foreign subsidiary, or from the abandonment of one of several operations where the continuing operations are and have been profitable and are virtually certain to be profitable enough to offset the loss carryforwards; and (b) losses of one or more subsidiaries of a profitable parent company where the carryforward will be made available as an offset against other taxable income by filing a consolidated income tax return, or by claiming a bad debt deduction, or by some other means [AICPA, 1974]. It would not be appropriate, however, to record the tax benefit of a loss carryforward of a subsidiary company, even though the parent and other subsidiaries are profitable, if there are no specific plans to obtain the tax benefit from the loss [AICPA, 1974]. In those rare cases where operating loss carryforwards are expected to be realized beyond any reasonable doubt as offsets against future taxable income, the potential tax benefits would be reflected in the balance sheet as assets and should be classified as current or noncurrent depending on the extent to which realization is expected to occur within the current operating cycle [AICPA, 1974].

APB *Opinion No. 11* [APB, 1967] also discusses a situation in which it may be necessary to recognize a portion or all of the tax benefits of the loss carryforward as an offset to net deferred tax credits:

> Net tax credits should be eliminated to the extent of the lower of (a) the tax effect of the loss carryforward, or (b) the amortization of the net deferred tax credits that would otherwise have occurred during the carryforward period. If the loss carryforward is realized in whole or in part in periods subsequent to

> the loss period, the amounts eliminated from the deferred tax credit accounts should be reinstated (at the then current tax rates) on a cumulative basis as, and to the extent that, the tax benefit of the loss carryforward is realized.

The justification for recognizing loss carryforwards as an offset to deferred tax credits was that it would be unrealistic to require recognition of deferred tax credits while at the same time denying recognition of deferred tax charges, in the form of a loss carryforward. This follows because both the deferred credits and the deferred charges will reverse during the same future accounting periods. However, net deferred credits that will not be amortized until after the expiration of the loss carryforward period cannot be offset by loss carryforwards [APB, 1967].

AETNA'S ACCOUNTING FOR TAX BENEFITS

In 1982, Aetna included $203 million attributable to tax benefits of tax-loss carryforwards in its operating earnings. Aetna essentially made the following entry to record these benefits:[3]

Federal income taxes: tax benefits recoverable	203,000,000	
Federal income tax expense		203,000,000

The "federal income taxes: tax benefits recoverable" account appeared in the asset section of Aetna's December 31, 1982 Consolidated Balance Sheet; the "federal income tax expense" account appeared as a credit in Aetna's 1982 Consolidated Statement of Income.

The tax-loss carryforwards were generated by Aetna's property-casualty companies. To maximize shareholder returns over time, funds held for future property-casualty claim payments were invested primarily in tax-exempt securities. Taxable bonds were purchased as necessary to assure that the tax benefits arising from property-casualty underwriting losses could be used to offset current taxable investment income well before the 15-year carryforward period for tax-losses expired. The disputed tax-loss carryforwards arose primarily from the fact that property-casualty underwriting losses substantially exceeded the taxable investment income.

Aetna's management stated that it was "assured beyond any reasonable doubt, that the tax benefits of these tax-loss carryforwards will be realized."[4] Aetna's management identified several factors which reinforced its assurance. First, Aetna elected to consolidate its life companies, which generate substantial taxable income, with non-life companies for tax purposes.[5] This provided a partial offset against non-life losses. Second, investable funds generated by property-casualty operations and by property-casualty investment portfolios have been and are being directed toward taxable investments. Third, Aetna's non-insurance operations were expected to generate increasing amounts of taxable income in future years. Fourth, Aetna has undertaken several steps to accelerate recovery of these tax benefits, including selective additional sales of tax-exempt securities for reinvestment in taxable bonds. The timing, manner, and extent of these sales will be governed by market conditions and the development of other sources of taxable income within Aetna. Fifth, the company was considering the redeployment of other assets for which the current market value was higher than the carrying value. Finally, Aetna was considering various reinsurance programs which would allow it to accelerate the realization of taxable income through the release of reserves for claims far in the future.[6]

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[3] These tax benefits are for tax-loss carryforwards in excess of amounts deducted from existing deferred taxes.

[4] This statement and the following factors were included in Aetna's SEC Form 10-K for 1982.

[5] Life insurance taxation is complex. This consolidation may not be as simple as it seems. Moreover, continuing changes in the tax law make all plans for future benefits somewhat problematic.

Peat, Marwick, Mitchell & Co. stated that "we concur with the Company's application of generally accepted accounting principles with regard to the recognition of such benefits."[7] The SEC's staff advised Aetna in February 1983 that although the realization of the tax benefits by Aetna may be more likely than not, it had not, in the staff's view, met the accounting test of assurance beyond any reasonable doubt, and therefore, Aetna should appropriately adjust its financial statements. Aetna's management continued to believe that realization of these benefits was assured beyond any reasonable doubt, but did not wish to continue applying an accounting principle in the face of an SEC staff assertion that its application was not appropriate. Aetna's response was to discontinue current recognition of these tax benefits after the third quarter of 1982, but not to adjust prior quarters. In March 1983, the staff of the SEC began a formal investigation of Aetna's accounting for these benefits.[8]

Aetna first recognized tax benefits from loss carryforwards in the loss periods in 1975. At that time, the staff of the SEC reviewed this practice and after consideration took no exception to it. Tax-loss carryforwards again were generated by Aetna beginning in the third quarter of 1981 and their recognition in the loss period was disclosed in Aetna's notes to its consolidated financial statements for 1981 as follows:

> For financial statement purposes, a tax benefit of $26.6 million related to operating loss carryforwards, in excess of amounts deducted from existing deferred taxes, has been recognized in 1981. In the opinion of management, the utilization of these losses to offset future taxable income is assured beyond a reasonable doubt.

The impact of Aetna's accounting for these tax benefits in 1982 was disclosed in management's discussion and analysis of financial condition and results of operations as follows:

	1982 Operating Earnings (millions)	*1982 Operating Earnings per Share*
Operating earnings as reported (tax benefits recognized for first three quarters only)	$522	$5.80
Operating earnings if tax benefit of tax loss carryforwards was not recognized at all for 1982	$319	$3.50
Operating earnings if tax benefit of tax loss carryforwards was recognized for entire year	$538	$5.98

THE SEC POSITION

The staff of the SEC has taken a hard line in situations involving accounting for the tax benefits from loss carryforwards. *Staff Accounting Bulletin No. 8* [SEC, 1976] states: "It is the staff's opinion that the 'assured beyond any reasonable doubt' criterion established in APB *Opinion No. 11* is one of the most restrictive tests contained within the authoritative literature. Accordingly, the staff will expect the evidence supporting current recognition of a tax-loss carryforward to be highly persuasive."

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[6] Reinsurance provides income because loss relief is recorded at the face value of the future settlement while the premium to the insurance company providing the reinsurance is at a lower, present value.

[7] This statement was included in the independent auditor's report dated February 18, 1983.

[8] Aetna's discussion of its position and response is included in its SEC Form 10-K for 1982.

In response to a question about what are the key elements necessary to demonstrate that "future taxable income is virtually certain to be large enough to offset the loss carryforward . . . ," *Staff Accounting Bulletin No. 8* notes that

> numerous factors are to be considered and the relative significance will vary somewhat from case to case. However, the staff believes the following are particularly important:
>
> (a) A very strong earnings history.
> (b) Clear evidence that the loss was not attributable to a general economic decline.
> (c) The availability of reasonably feasible alternative tax strategies, such as the conversion of a tax-exempt portfolio to taxable securities.
> (d) Forecasts based upon realistic assumptions which indicate future earnings substantially in excess of the recorded loss carryforward.

Staff Accounting Bulletin No. 8 also states that "normally, the registrant should be able to demonstrate the existence of all of these factors. Seldom, if ever, would any one element, such as forecasts of future earnings, standing alone be sufficient to demonstrate that future earnings will meet the 'virtually certain' test" [SEC, 1976].

A *Business Week* article dated February 28, 1983 provides some insight into the SEC's position:

> "We don't think Aetna met the test that says future profits must be beyond a reasonable doubt," says an SEC accountant. "We think the test is much more severe, and we're concerned because we know a lot of companies are moving in Aetna's direction." The company and the commission can pursue a variety of administrative and legal procedures to resolve the conflict, but the SEC would appear to have the upper hand because the securities laws give it the power to set accounting standards.[9]

This article also noted that the SEC acted against Aetna only after questions about the insurer's accounting practices were raised publicly.

DISCUSSION OF AETNA'S POSITION

Aetna may have been able to make a good case for each of the factors listed in *Staff Accounting Bulletin No. 8*. It had reported earnings in each of the last ten years; the tax-benefits were generated by its non-life companies, principally the property-casualty operations, and not by a general economic decline; the company had several feasible tax strategies available to it, including converting tax-exempt securities to taxable securities; and it is likely that the company could have provided forecasts for 15 years which reflected future earnings in excess of the recorded loss carryforwards.

Earnings History

First, consider the strong earnings history factor or criterion. Aetna reported earnings in each of the last ten years and these earnings have ranged from a low of $107.3 million in 1975 to a high of $585.4 million in 1979. Its earnings in 1982 for the employee benefits division, the life, health, and annuity lines of the personal financial security division, and the American Re-insurance Company were at or near their highest levels, but the earnings for the property-casualty operations were well below their highest levels.

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[9] "Profits the SEC Wants to Deflate," *Business Week*, February 28, 1983.

Even though Aetna has had a consistent record of earnings, it is important to recognize that a large proportion of the earnings in each year has been tax-exempt. Casualty companies historically have concentrated their investments in tax-exempt securities and have purchased or held taxable securities only to the extent needed to provide enough taxable income to offset tax losses from underwriting. Because of these investment practices, earnings in each year reflect a large proportion of nontaxable earnings (e.g., tax-exempt interest and dividends eligible for the 85 percent dividend-received deduction).

At December 31, 1983, over half of Aetna's investments of $7,950 million related to property-casualty operations were state and municipal bonds. The net investment income from these investments was sufficient to cover underwriting losses for financial accounting purposes; but, since most of this income was tax-exempt, it was not sufficient to cover these losses for tax purposes. Tax-exempt interest and dividends eligible for the 85 percent dividend-received deduction represented about 80 percent of the difference between the expected federal income tax expense of $97.8 million based on the 46 percent federal income tax rate and the actual tax credit of $189.8 million in 1982. Aetna reflected net tax credits for both 1981 and 1982 and tax return operating loss carryforwards increased from $78.7 million at December 31, 1980 to $736.5 million at December 31, 1981 and to $1,312.9 million at December 31, 1982. At December 31, 1983, Aetna had tax return operating loss carryforwards of $1,613.9 million. Although Aetna consistently has generated earnings, it apparently has not consistently generated taxable earnings. And it is the history of taxable earnings that is relevant in assessing its ability to realize tax benefits from loss carryforwards.[10]

Economic Decline

Aetna's tax loss carryforwards were generated by its property-casualty operations rather than by a general economic decline. Thus, Aetna apparently met the second test for current realization. However, the property-casualty operating problems were severe. Aetna acknowledged in its SEC Form 10-K for 1982 that the company and the insurance business generally "have been operating in a period of dramatic change and intense competition compounded by a volatile economy. . . . Commercial casualty and property is highly price competitive. . . . Underwriting profitability in the property-casualty industry has tended to fluctuate considerably over cycles ranging from five to seven years."

Yet, a research report dated February 15, 1983 concluded that the fundamental outlook for Aetna's group and property-casualty insurance business was relatively favorable:

> Aetna's property-casualty loss ratio has already stabilized, due to the better pric-

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[10] Concern about Aetna's ability to generate taxable earnings also was expressed by Denis J. Callaghan and Jeffrey Cohen of Dean Witter Reynolds Inc. in a research note dated February 15, 1983. Tax losses in the property-casualty operations and consolidated companies in 1982 and estimated losses in 1983 and 1984 primarily were created by underwriting losses less taxable investment income. The life insurance companies generated taxable income. The diversified operations reported positive earnings to shareholders, but they currently generate large tax losses. Callaghan and Cohen observed that Aetna was accelerating its taxable income by (1) selling tax-exempt bonds and reinvesting the proceeds in taxable securities, (2) re-insuring some of its very long-term reserves, and (3) shifting tax credits back to its partners in return for taxable income. Callaghan and Cohen estimated declining tax losses in the property-casualty companies in 1983 and 1984, due to increased taxable investment income and re-insurance transactions. An estimated decline in the diversified operations tax loss in 1983 reflected the inclusion of a full year's pretax earnings for Geosource and Federated Investors and assumed that Aetna would shift some tax credits to its partners.

ing and underwriting disciplines that were implemented well over a year ago. Loss reserves appear to be in good shape, especially in relation to the favorable trend established in paid losses during the past 15 months or so. Group health pricing remains very strong. The combination of an economic recovery and better pricing in the commercial insurance markets, which we expect to emerge later this year, suggests that Aetna's earnings could begin to improve cyclically as much as a year sooner than many other companies.[11]

Alternative Tax Strategies

Aetna appears to have several feasible alternative tax strategies for realizing its loss carryforwards. Aetna has announced its intention to generate sufficient taxable income to benefit from the tax losses. One of the planned alternatives involves the redirection of tax-exempt investments into taxable ones. There is little doubt that such a strategy could succeed, but there are economic implications to its adoption. Such a strategy implies an economic environment in which historical relations between underwriting profitability and investment income have changed.[12]

The long-standing practice of the casualty insurance industry is to hold most of the loss reserves in tax-exempt securities. This is optimal as long as the underwriting activity generates taxable income and the yield on tax-exempt securities exceeds the after-tax yield on taxable securities:

$$R_{TE} > (1-t)R_T, \qquad (1)$$

where R_{TE} is the yield on tax-exempt securities, R_T is the yield on taxable securities, and t is the corporate tax rate (typically 46 percent). The condition in equation (1) has historically held for firms subject to a 46 percent marginal tax rate. If we introduce tax losses from underwriting and delay the realization of tax benefits from future underwriting profitability, the decision to invest in tax-exempt securities is optimal provided:

$$R_{TE} > [1 - \frac{t}{(1+k)^n}]R_T, \qquad (2)$$

where k is the time discount rate and n is the years to realization of the tax benefit. As the number of years before realization of current tax losses increases—that is, as n increases—or the time discount rate increases, the bracketed expression in equation (2) approaches one, and taxable investments become more attractive since the right-hand side increases.

The use of a mixed portfolio of taxable and tax-exempt securities with the proportions chosen based on the profitability of the underwriting activity is appropriate. Given a short, stable cycle of profitability, the proportions would be stable as well. Tax losses have been large and growing since 1980. Aetna began a substantial restructuring of assets in 1982 coincident with the SEC dispute and concerns over current realization of tax benefits for financial reporting purposes. With the benefit of hindsight it can be argued that the restructuring should have occurred earlier, but Aetna's management made decisions in 1980 and 1981 which re-

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[11] Report by Denis J. Callaghan and Jeffrey Cohen of Dean Witter Reynolds Inc. dated February 15, 1983.

[12] The property-casualty business essentially consists of the receipt of premiums, payment of expenses and losses, and investment of the cash in the interim. The profitability of the underwriting side of the business is commonly reflected in the combined ratio of expenses and losses to premiums. When underwriting is profitable, the combined ratio is less than one and much of the portfolio is invested in tax-exempt securities. The following table presents some related data for the property-casualty portion of Aetna's operations:

Year	*Combined Ratio*	*Percentage in Tax-Exempts*
1983	108.1	51.1
1982	107.8	55.8
1981	106.4	56.9
1980	102.2	60.4
1979	94.9	64.5

flected its expectations. At that time the price competition and resulting underwriting losses on property-casualty operations were not expected to persist. Forecasting is always problematic. The opinions of analysts and others ranged from predictions of a return to shorter historical profitability cycles, to predictions of a permanent change in the nature of the business. The SEC correctly predicted that other insurers would soon generate tax-loss carryforwards as Aetna did.[13]

Assuming that Aetna's management made a correct strategic choice to generate taxable income, there are still tactical questions. For example, Aetna announced a plan to actively rearrange the portfolio rather than simply to direct new funds to taxable investments. This implies transaction costs and recognition of capital gains or losses on sales of current holdings. Aetna's 1982 SEC Form 10-K revealed unrealized losses on average for the tax-exempt portfolio. A corporate taxpayer can use these only to offset capital gains with a three-year carryback and a five-year carryforward.

A second announced strategy involved the transfer of existing long-term liabilities in the re-insurance market. Aetna has booked losses at their future expected value and has stated the liability in these terms. However, other insurers can be paid the present value of the obligation to accept the responsibility for future payment. In the process, Aetna generated book and taxable income in the amount of the difference between the present value and the future (nominal) value of these liabilities. This technique has gained attention recently and is currently the subject of debate in the tax committees of Congress.[14]

Aetna has reported several other alternatives which can be used to generate taxable income, including consolidation of life and non-life companies for tax purposes, increased profits from non-insurance businesses, and redeployment of assets with unrealized gains. These alternatives are all subject to uncertainty about tax laws and possible changes, the ability to attain stated goals and predictions, and the ability to replace assets in a favorable manner. Transaction costs may be especially large for redeployment of assets. These strategies, while feasible, are not without risk and do not seem to meet the requirements of APB *Opinion No. 11* [APB, 1967] for virtually certain taxable income.

MARKET REACTIONS TO THE DISPUTE

The economic events confronting Aetna and the related dispute with the SEC are reflected in Aetna's share price performance in this period.[15] Figure 1 graphs price indices for Aetna, the S&P 500, multi-line insurance companies, and property-casualty companies from September 30, 1982 (prior to the tax benefits controversy) through September 30, 1983 (after the controversy was resolved). Each index is defined with September 30, 1982 equal to 100.[16] A substantial

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[13] See "Insurer Takes Novel Steps to Avoid Loss," *The Wall Street Journal,* June 4, 1984 which describes the plight of USF&G Corporation.

[14] Callaghan and Cohen observe in their report dated February 15, 1983 that "the effect of the re-insurance transactions could be quite large. Because of the time value of money, the cost of reinsuring very long-term reserves could be only one-third the amount currently held in those reserves. For example, reinsuring $150 million in long-term reserves might cost $50 million, and $100 million would be released from reserves into taxable income. Each transaction produces a one-time gain, but Aetna could do a series of these transactions in 1983 and 1984 as it needs the taxable income."

[15] Callaghan and Cohen note in their report dated February 15, 1983 that they "now see the stock in a bottoming trend, with limited downside risk. Moreover, the tax issue has probably run its course in terms of having a major market impact on the stock."

[16] The Aetna index is not dividend adjusted, but neither is the S&P 500. Aetna's dividends could explain one-day ex-dividend differences, but not long-term patterns.

FIGURE 1

PRICES INDICES FOR AETNA, S&P500, AND PROPERTY/CASUALTY AND MULTI-LINE INSURANCE COMPANIES

9/30/82 = 100

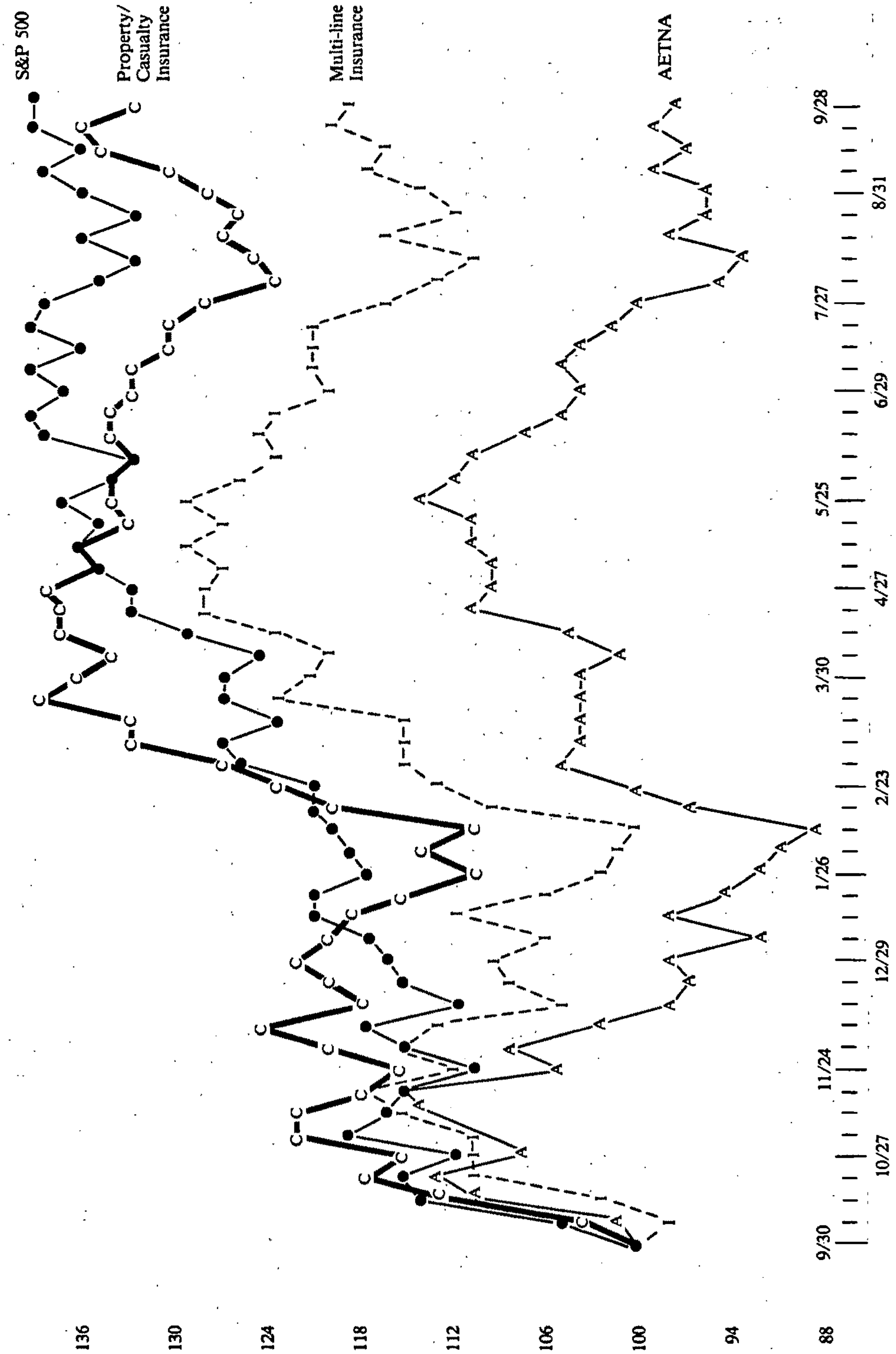

TABLE 1

ABNORMAL RETURNS AT THE RELEASE OF NEWS ARTICLES

Panel A—The Wall Street Journal

Publication Date	*Subject*	*Abnormal Returns* *Day -1*	*Day 0*	*Total*
2/1/83	Ruling Expected from SEC	−.0114	−.0111	−.0225
2/9/83	SEC Rules Against Aetna	−.0032	−.0101	−.0133
3/22/83	SEC Formally Probes Refusal to Restate	−.0069	−.0093	−.0162
		−.0215	−.0305	−.0520

t-statistic = 1.647
One-tailed alpha = .05

t-statistic calculated as cumulative return $\div \sqrt{6 \times \text{daily variance}}$

Panel B—Fortune
"Behind the Profits Glow"

Availability Dates	*Abnormal Return*
10/27/82	−.0108
10/28/82	−.0229
10/29/82	−.0163
11/1/82	+.0088
	−.0412

t-statistic = 1.600
One-tailed alpha ≈ .055

divergence is apparent between Aetna and the S&P 500 beginning in early October 1982 and reaching a 27-point difference in late January 1983. The divergence increases again in late May and June of 1983 to almost 35 points. The indices for the multi-line and property-casualty insurance companies suggest that while the relative decline was not unique to Aetna, it was more pronounced for Aetna. The patterns are similar for Aetna and the property-casualty and multi-line insurance companies after the divergence which took place early in the time period covered.

To examine the effects of the tax benefits controversy on Aetna's market value more directly, the abnormal returns were calculated from the daily, dividend-adjusted returns of Aetna using the market model. Returns from September 30, 1982 through February 29, 1984 (360 observations) were regressed on the corresponding values of the S&P 500 and the prediction errors were recorded. The results are summarized in Table 1. Panel A of Table 1 reveals that a cumulative, abnormal, six-day return of approximately 5.2 percent was associated with three *Wall Street Journal* announcements about the tax benefits issue in February and March of 1983. The flow of news

TABLE 2

CHRONOLOGY OF AETNA'S TAX CARRYFORWARDS IN THE GENERAL BUSINESS PRESS

Date	
11/15/82	*Fortune* article "Behind the Profits Glow at Aetna" includes consideration of the impact of tax loss carryforwards.
2/1/83	*WSJ* discloses imminent SEC ruling on Aetna's accounting.
2/9/83	*WSJ* reveals SEC order to abandon accounting practice.
2/10/83	*WSJ* reports Aetna's plans to offset the SEC ruling.
2/24/83	*WSJ* "Heard on the Street" discusses implications of SEC ruling for existing price war in casualty insurance.
3/7/83	*Fortune* article "Battle over Earnings: The SEC vs. Aetna" appears.
3/22/83	*WSJ* announces formal SEC probe into Aetna's refusal to restate earnings for first three quarters of 1982.
5/5/83	*WSJ* announces FASB has included tax loss carryforwards as a major component of "Accounting for Income Taxes."
7/8/83	*WSJ* reveals that Aetna ended dispute with SEC by restating all of 1982 results.
8/1/83	*Business Week* article "Profit Pains at the New Aetna" appears.
9/7/83	*WSJ* questions Aetna's moves to lift profits.

about this issue, and more generally about Aetna, was substantial.[17] A chronology of major announcements in the general business press is provided in Table 2. The first public discussion of the effects of the accounting method appears to have been a *Fortune* article dated November 15, 1982 (and available two weeks earlier). Panel B of Table 1 reveals a significance level of just over five percent on a four-day abnormal return of −4 percent associated with the *Fortune* article.[18]

The results in Figure 1 and Tables 1 and 2 are consistent with negative evaluations by investors of Aetna's controversy with the staff of the SEC about accounting for tax-loss carryforwards. The linkage between the accounting method and the market's reactions is not clear, since market reactions could reflect reassessments of the economic significance of reported earnings, the costs associated with the regulatory conflict, or anticipation of subsequent management reactions by Aetna.

Aetna's accounting for the tax benefits of loss carryforwards had its defenders in addition to Peat, Marwick, Mitchell & Co. Callaghan and Cohen of Dean Witter Reynolds Inc. made the following observations in a careful analysis on February

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[17] These three dates were selected because they represented news items about this issue which were free of unrelated disclosures and *ex ante* seemed to represent changes in the likelihood that Aetna eventually would have to restate all of the results for 1982. Confounding information appears, for example, on May 2, 1983, when the WSJ announced that the SEC ordered abandonment of the method together with announcement of an 18 percent rise in the first-period profit. Similarly, the February 24, 1983 "Heard on the Street" column discussed the issue and speculated that the accounting method requirement would lead insurers to end the current price war. *Ex ante*, the implications of this speculation are ambiguous.

[18] These dates were chosen based on *Fortune*'s publication schedule where Monday, November 1, 1982 corresponds to the newsstand availability of the November 15, 1982 issue and the previous Wednesday, Thursday, and Friday represent receipt by mail subscribers.

2, 1983, just following the *Wall Street Journal* disclosure of the pending ruling:

> We are comfortable with Aetna's accounting methods. We believe that recognizing the full benefit of tax credits against underwriting losses is the appropriate procedure under the current accounting and tax regulations and represents a fair presentation of current earnings. It seems quite likely that Aetna will be able to generate sufficient taxable income over 15 years to offset its 1981 and 1982 tax losses. However, we do worry about the potential cumulative effect of a substantial buildup of a deferred tax asset if large tax losses are produced year after year. Obviously, there is a point where Aetna would no longer be able to demonstrate "beyond any reasonable doubt" its ability to earn off the deferred tax asset. We also worry about how much of a premium Aetna will have to pay for taxable income in order to earn off the tax asset, especially if the cumulative buildup of the asset is substantial. . . . We should stress that regardless of which way the SEC rules, the use of tax-loss carryforwards will have no effect on future operating earnings once Aetna is no longer in a current tax-loss position. If the SEC ruling is negative, the effect of using the tax-loss carryforwards in future years will be reported below the line as an extraordinary item. If the SEC ruling is positive, Aetna will be allowed to continue to fully tax effect its underwriting losses in its income statements and will build up a deferred tax asset on its balance sheet. As the tax credits are earned off, the deferred tax asset will be reduced, with no impact on the income statement.

When Aetna released annual results, Callaghan and Cohen updated their analysis, observing that the fourth-quarter income effect was less than their expectations (February 15, 1983):

> It seems reasonable to assume that Aetna is now willing to accept some financial loss in its strategy to generate taxable income. Otherwise, it would not have waited until now to reposition itself along the lines described above. We suspect, however, that much of the penalty may be in the form of opportunity costs and/or stretched out over many years. . . .

CONCLUSIONS

Aetna's accounting for its tax benefits from loss carryforwards in 1982 provides a classic example of the role of judgment in the application of generally accepted accounting principles. Aetna's management and the staff of the SEC had different reasons for becoming involved in this dispute and they interpreted existing criteria differently.

Why did Aetna choose to recognize these tax benefits in periods of tax losses? Aetna's management may have believed that this recognition was correct given Aetna's circumstances, and it may have wanted to recognize the effects of these tax benefits in earnings for 1982.[19] Why did the staff of the SEC choose to question Aetna's accounting for these tax benefits in 1982? SEC accountants may have believed that recognition of these tax benefits in 1982 was incorrect given Aetna's circumstances and may have wanted "to make an example" of Aetna because other insurance companies were poised to follow its precedent if it was successful.[20] Why did Aetna refuse to change its accounting method and restate its earnings for 1982? Aetna's management may have believed that it had a good case for its position. It also may have been concerned about the legal status of published financial statements which reflected the tax benefits in earnings for 1982. Aetna included financial statements which reflected tax benefits in earnings for 1982 in prospectuses for securities offerings. Aetna also was involved in acquisition and merger activity during this period.

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[19] Aetna's SEC Form 10-K for 1982 provides a very complete discussion of management's position.

[20] See "Profits the SEC Wants to Deflate," *Business Week*, February 28, 1983.

Aetna's stock values declined sharply in relative terms during the period of dispute. It is reasonable to associate this decline with real economic characteristics of the property-casualty insurance industry and also with various choices of Aetna's management. It may be that the public controversy itself induced investors to modify their assessments of Aetna and of the industry.

The dispute focused on interpretations of criteria provided in APB *Opinion No. 11* [APB, 1967]. These criteria were framed and interpreted when the carryforward period was five years and later extended to seven years [AICPA, 1974; SEC, 1976]. A five- or seven-year period constrained management's opportunities to realize the tax benefits of loss carryforwards and reasonable forecasts of taxable earnings could be meaningfully interpreted for such a time period. The carryforward period is now 15 years. This longer carryforward period provides managements with increased opportunities to realize the tax benefits of loss carryforwards by implementing various alternative tax strategies. Increased opportunities do not necessarily provide sufficient assurance that the tax benefits will be realized, but a company can be changed dramatically in the pursuit of tax benefits over a 15-year period.

The FASB currently is reassessing accounting for income taxes, including the issue of in what periods the tax effects of net operating loss carryforwards should be recognized in financial reporting income [FASB, 1983]. The FASB has raised several salient points: (1) the current 15-year carryforward period is much less restrictive than the former five-year period; (2) the current requirement for recognition is that realization of the benefits be assured beyond a reasonable doubt; and (3) guidelines for recognition of the benefits could be established which more closely parallel existing practices for receivables and similar assets [FASB, 1983].

The FASB's conceptual framework provides the basis for some questions which can be used to structure the issue of when to recognize the tax benefits of loss carryforwards in financial reporting income. Elements of financial statements, such as assets, liabilities, revenues, and expenses, are defined in FASB *Statement of Financial Accounting Concepts No. 3* [FASB, 1980]. Recognition and measurement criteria are set forth in FASB *Statement of Financial Accounting Concepts No. 5* [FASB, 1984].

First, are these tax benefits assets? Do these tax benefits meet the definition of an element of financial statements? The FASB has defined assets as "probable future economic benefits obtained or controlled by a particular entity as a result of past transactions or events" [FASB, 1980, para. 19]. Three characteristics have been associated with assets: (1) they embody a probable future benefit that involves a capacity singly or in combination with other assets, to contribute directly or indirectly to future net cash inflows; (2) a particular enterprise can obtain the benefit and control others' access to it; and (3) the transaction or other event giving rise to the enterprise's right to or control of the benefit already has occurred [FASB, 1980, para. 20]. The tax benefits of loss carryforwards appear to qualify as assets under the FASB definition. They are future economic benefits which have arisen because of past events and which can be controlled by a particular enterprise.

Second, how uncertain are these tax benefits? Do these tax benefits meet the criteria of measurability, relevance, and reliability which bear directly on the matter of uncertainty [FASB, 1984, para. 63]? Uncertainty exists about whether an enterprise can obtain these benefits. The tax benefits are probable, but not certain. The existence and amount of these tax benefits do not need to be certain for the benefits to qualify as assets [FASB, 1980, para. 39], but whether these benefits are formally recognized and measured as assets depends on how uncertain they are. That is, accounting for these benefits requires an assessment of the probability that they will be realized. The FASB has defined realization as "the process of converting resources and rights into money" [FASB, 1980, para. 83]. An enterprise that can be characterized as a going concern and that is accounted for on that basis can reasonably be expected to obtain at least some of the tax benefits of loss carryforwards. This realization may occur in the normal course of events or because of responsive changes in the economic structure of the company, such as those instituted by Aetna and others.[21]

Aetna's accounting for its tax benefits of loss carryforwards reflects the interactions among tax accounting, financial reporting, and economic choices. With a 15-year carryforward period, Aetna and other companies have substantially more time in which to restructure their asset positions or to institute other tax strategies to obtain these tax benefits. The staff of the SEC was aware of these strategies but did not find them persuasive in meeting the requirements of APB *Opinion No. 11* [APB, 1967].

We believe that the requirement for realization of these tax benefits "to be assured beyond any reasonable doubt" is more restrictive than the criteria suggested by the FASB conceptual framework and in most cases has precluded the recognition of these benefits as assets.[22] This requirement also seems to be inconsistent with the treatment of other assets, which are recognized and measured as assets on the expectation that they will have future value and will be written down only when evidence arises which negates their future value. The well-established requirements of full disclosure and reasonable assurance of realization have been adequate in accounting for most assets. A similar perspective should be taken with the tax benefits of loss carryforwards. These benefits should be recognized and measured as assets in the loss period unless specific doubts exist about their future realizability. Current recognition of these benefits should be disclosed separately and footnotes should describe the probability of realization. Changes in accounting estimates then should be used to reflect changes in the probability of realization [APB, 1971].

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[21] Like Aetna, USF&G Corporation, a multi-line insurer, has incurred substantial tax-loss carryforwards. See "Insurer Takes Novel Steps to Avoid Loss," *The Wall Street Journal*, June 4, 1984 and the company's 1983 annual report.

[22] The propensity to not recognize assets may create problems in recognizing losses of future economic benefits [FASB, 1980, para. 42]. Is it better to recognize these tax benefits as assets and then recognize losses of these benefits if events or circumstances cause such losses, or is it better to not recognize either the assets or the losses?

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Accounting for Deferred-Payment Notes

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ABSTRACT: This article discusses the accounting implications of a new type of financial security introduced on the European bond market. The security, known as a deferred-payment note, allows the investor to acquire a note by paying a portion of the issue price at the time of issuance. The remaining amount is required to be paid in a second installment due some months later. Alternative accounting treatments are presented. These treatments are evaluated in light of the FASB's conceptual framework pronouncements. The paper concludes that the FASB's current position fails to provide appropriate guidelines which the profession can use to resolve this new financial reporting issue.

DEFERRED-PAYMENT notes recently have become popular. On January 17, 1983, *The Wall Street Journal* (p. 30) reported that the international bond market had been "flooded" with offerings of this type. An interesting feature of these securities is that the borrower asks for only a portion of the issue price to be paid at the time of issue. The balance typically is required to be paid by the noteholders several months after the issuance date.

This paper identifies some interesting and important accounting questions raised by this new breed of security. We use as an illustrative case a recent $100 million dollar deferred-payment debt issued by Coca-Cola International. The features of the Coca-Cola issue first are described, the underlying economic rationale for the issue is discussed next, and finally, alternative ways of accounting for the issue are explored.

This particular type of security is only one of several types of complex securities that have been appearing recently in financial markets. The choice of the appropriate accounting principle for recording this issuance, or for that matter for any other novel economic transaction, presumably is being facilitated by the Financial Accounting Standards Board's conceptual framework project. In the third section of this paper, we explore the guidance provided by the conceptual framework project in addressing the major problems raised in accounting for deferred-payment notes.

THE ECONOMICS OF THE ISSUE

On February 1, 1983, Coca-Cola International Finance N.V., a wholly-owned Dutch subsidiary of The Coca-Cola Com-

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pany, offered $100 million of 9-7/8 percent guaranteed notes on the Eurobond market. Coca-Cola International is a finance company whose primary activity consists of borrowing funds outside the United States (not subject to SEC jurisdiction) and lending such funds to The Coca-Cola Company and its subsidiaries.

According to the Prospectus, the net proceeds from the sale would be made available to The Coca-Cola Company for general corporate purposes, including the repayment of short-term borrowings. Specifically, the notes required a 30 percent down payment on February 1, 1983. The notes were denominated in $5,000 multiples so the investor had to pay an additional $3,500 by August 1, 1983 to avoid the risk of forfeiture. The notes bore a rate of 9-7/8 percent per annum, payable in arrears on 30 percent of the principal amount until August 1, thereafter on 100 percent of the principal. The notes mature on August 1, 1992 and are redeemable in whole at any time, at the option of the issuer, if certain changes in the U.S. or the Netherlands tax laws take place. If the investors were to default on the August 1, 1983 installment, the issuer would be entitled, after a 15-day grace period, to retain the first installment of the issue price already received for such note and would have no obligation to refund the installment or to pay interest thereon for any period prior to, or subsequent to, August 1, 1983.

The investor who subscribed to a $5,000 note on February 1, 1983 obtained the right to acquire the future stream of cash flows associated with the note (the repayment of the principal in 1992 and the semi-annual interest payments) by paying $3,500 on August 1, 1983. The rational investor would pay the second installment only if the present value of the future cash flows, discounted at the market rate of interest prevailing on August 1, exceeded the $3,500 price of exercising this right. We calculate the market rate of interest at which the investor would be indifferent to be 16.4 percent, if taxes are ignored. If the market rate exceeded this rate of interest, the investor would be better off by defaulting on the note and investing in an alternative security.

A decline in interest rates would benefit the investor, who has obtained a commitment for the higher interest income by subscribing to the note at the February 1 rate. There is also the possibility of a speculative gain. If the market price of the notes, originally issued at par, were to rise to 103, for example, investors would be able to sell their holdings at a profit of $3 on an investment of $30.

The actual rate of interest at which an investor in such a security would be indifferent to paying the remaining installment depends on the tax laws to which the investor is subject. The investors in the Eurobond market are from several different countries and consequently are subject to a variety of different tax laws. The effects of these tax provisions are investor-specific and cannot be generalized across investors. Nonetheless, they have implications for the investors' decision to pay the second installment. For example, if the tax laws allow the investor to write off a forfeited down payment against taxable income for the current year, the threshold rate drops to significantly below the 16.4 percent computed earlier.

The impact of the down payment on the indifference point for the investor can be illustrated with the example of another sale of deferred-payment notes issued by General Electric Credit Corporation (GECC). The notes were sold at about the same time as Coca-Cola's notes and carried approximately the same interest rate. The GECC notes required a down payment of only 14.5 percent. The threshold rate of interest for the investor to decide on whether to default on the second payment in this latter case would have been 13.3 percent, again ignoring taxes.

Another factor which affects the economics of deferred-payment issues is changes in currency exchange rates. In early 1983, for example, when the Coca-Cola issue was made, the dollar was trading at a record high level relative to several other currencies. It was widely expected that Japanese investors, in particular, would be attracted to the deferred-payment notes in anticipation of a stronger value for the Japanese yen. By making a partial down payment, these investors were locking themselves into the present interest rate while expecting to complete the contract with fewer yen six months later. This transaction could generate leveraged holding gains on their long positions in Japanese yen. As it happened, however, the yen continued to fall during the next six months, significantly increasing the default risk on the notes.

The issuer of these notes is locked into the February 1 interest rate. In the case of Coca-Cola this rate was 9-7/8 percent. The company profits from this decision if the market rate of interest is greater than this rate on August 1. However, if interest rates decline, and the value of the notes goes up, Coca-Cola incurs a loss equal to the difference between what it could have issued the bonds for and the actual contract price. This loss would not be recorded since it is an opportunity loss to the issuer.

The Coca-Cola issue was one of a number of deferred-payment issues floated in the Eurobond Market by U.S. companies in late 1982 and early 1983. A total of $2.4 billion worth of these notes were issued during a three-month period. Most of these notes appear to have been issued by dealers and underwriters on a "best-efforts" basis. The uncertainty prevailing in the market shortly after some of these issues were made led many market watchers to conclude that a real risk of forfeiture existed for these notes. It was feared that investors would fail to complete purchases for some of the offerings. According to *The Wall Street Journal* (January 24, 1983, p. 34 and February 7, 1983, p. 24), default by investors was expected to hurt the issuers, who would have to look elsewhere to meet their needs for funds. While the borrowers would be able to retain the down payment, this was expected to be generally insufficient to compensate for both the commissions (which would be payable on the entire amount of the issue rather than the down payment) and for the increased interest cost that would be paid on a traditionally structured debt issue floated when interest rates were rising. Clearly, there was considerable uncertainty surrounding the outcome of the issue.

ACCOUNTING FOR THE ISSUANCE

The central accounting problem is as follows: Should these notes be viewed as the issue of options, followed by the issue of debt (i.e., *two* transactions), or as a single issue of debt, collectible in two installments (i.e., *one* transaction)? These two different ways of conceiving this deferred-payment situation result in two distinctly different ways of accounting for the notes.

The Two-Transaction Approach

The two-transaction approach views the circumstances as consisting of two distinct events. The first event takes place on February 1, when the issuer receives the down payment from the investor. By making this payment the investor has acquired the right to purchase, at a future date, the cash flows associated with the note. The actual purchase of these cash flows is an executory contract whose execution depends upon the future movement of interest rates. The down payment is thus treated as an option:

Feb 1	Cash	$30,000,000	
	Notes Payable-Option		$ 30,000,000

The second event takes place on August 1 and is either the receipt of the balance of the issue price or default. Payment by the investor of the second installment would result in an increase in Coca-Cola's liability. Default, on the other hand, would result in the elimination of the liability, and give rise to a gain. Default would be recorded as:[1]

Aug 1	Notes Payable-Option	$30,000,000	
	Gain on Forefeiture		$ 30,000,000

Receipt of the installment on the due date requires recognition of an additional liability, but the valuation of this liability is still to be resolved. Under the two-transaction approach, the obligation under the note is viewed as being two separate obligations, one entered into on February 1, and the other entered into on August 1. Should the liabilities arising from these obligations be valued in different ways, using the appropriate market interest rates on February 1 and August 1, respectively? Or should valuation be based solely on the interest rate prevailing when the sequence of events was initiated, that is, on February 1? Intertwined with the question of how the liability is to be measured is, of course, the question of how interest expense is to be computed.

The following paragraphs illustrate these two alternative methods. The method demonstrated first is based on the principle that the rate existing at the time of issuance of the note should be used to value the total liability. Coca-Cola contracted the liabilities on February 1, at an interest rate of 9-7/8 percent. If the interest expense on the notes is to reflect the cost to the company at the time the notes were issued, it would seem that the appropriate interest rate is 9-7/8 percent for both liabilities. In other words, whatever the interest rate prevailing on or after August 1, the total liability on account of the note would always be valued at $100 million and interest expense would always be computed at 9-7/8 percent. This approach gives due weight to the fact that the company issued the security in order to lock itself into the interest rate prevailing on February 1.

Receipt of the second installment would result in the following entry under this accounting treatment:

Aug 1	Notes Payable-Option	$30,000,000	
	Cash	$70,000,000	
	Notes Payable		$100,000,000

Interest expense also would be recognized at that time at 9-7/8 percent on the initial $30,000,000 received earlier.

Aug 1	Interest Expense	$ 1,481,250	
	Interest Payable		$ 1,481,250

Interest expense in subsequent periods would continue to be recorded at 9-7/8 percent, but on the entire $100 million.

The alternative way of looking at the problem is that there are two separate events, and that consequently the circumstances surrounding each transaction should be considered in valuing the liability arising from it. The first liability, for the $30 million, is entered into for a six-month period on February 1, at a cost of 9-7/8 percent, the market rate at the time. The incurrence of the second liability by Coca-Cola depends upon the interest rate prevailing on August 1. If, for example, the interest rate on August 1 is 12 percent, the investor can be expected to discount the future incremental flows on the note at 12 percent. It might seem appropriate then for this second liability to be valued on the books at its present value, and for interest expense to be computed using a rate of 12 percent, since these are the factors that determined the consummation of the transaction.

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[1] Interest due on the forfeited amount is forfeited. Recognition of interest expense for the six months ended August 1 would result in a corresponding increase in the gain account. Such an entry might be trivial because of the offsetting expense and gain accounts, unless the books had been closed at some time between February 1 and August 1 and interest had been accrued.

Using an interest rate of 12 percent as an example, the value of the total liability on August 1 should be $91,946,970. This amount is made up of $30,000,000, the first liability, plus $61,946,970, which is the present value of the principal and interest for nine years on the $70,000,000 portion of the note, discounted at 12 percent. Since the amount of consideration received for this contract is $100 million, it would appear that the fortuitous movement of interest rates gives the issuer a gain. If interest rates had declined, instead of rising to 12 percent as we assumed, it would have suggested that the company had made an error of judgment in locking itself into a higher interest rate on funds not yet received, and a loss would have been incurred.[2] The journal entry for our example rate of 12 percent would be:

Aug 1	Cash	$70,000,000	
	Notes Payable-Option	$30,000,000	
	Notes Payable		$ 91,946,970
	Gain on Issue		$ 8,053,030

Interest expense on August 1 would be recorded as before at 9-7/8 percent of the initial amount received:

Aug 1	Interest Expense	$ 1,481,250	
	Interest Payable		$ 1,481,250

Subsequent entries for interest would, however, reflect a 9-7/8 percent rate on the $30,000,000, and a 12 percent rate on the balance of $61,946,970.

The argument that favors accounting for the transaction as two separate events basically stems from the executory nature of the contract. On February 1, 1983, Coca-Cola has committed itself to supply a financial instrument to the marketplace with a defined set of cash flows only if the investor decides to complete the contract. The investor maintains an unrestricted right to cancel the contract by forfeiting the downpayment.

Accounting for deferred-payment notes is most similar to the accounting for the sale of stock options. The first installment is treated as the sale of options to acquire notes. These options confer upon the investors the right to acquire the notes in the future. The incurrence of an obligation for the entire $100 million of notes is contingent upon the future willingness of the investor to enter into the contract and is therefore within the realm of executory contracts. If the option to acquire the notes is exercised, a liability must be recognized to account for the future cash outflow that will result from servicing this debt.

The One-Transaction Approach

The one-transaction approach views the debt as being one transaction that takes place on February 1, rather than being an executory contract. Mutual performance is believed to have taken place. The issuer receives $30 million and a current receivable, the default on which carries a substantial penalty. In exchange, the issuer has incurred the obligation to make future payments to the noteholder as scheduled.

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[2] The accounting for deferred-payment notes raises some interesting questions that we do not address only because they are not directly related to our main concern, namely the recognition and valuation of the liability. One such issue is the treatment of this gain or loss that arises on August 1. A case could be made for viewing the gain or loss as a modification of the terms of the loan agreement and as such to be amortized over the term of the note as an adjustment to interest expense. If the entire amount of gain or loss is to be recognized in the current period, the question still remains as to whether it should be considered as ordinary (as are gains and losses on purchase commitments) or extraordinary (as are gains and losses on early extinguishment of debt).

From this viewpoint, the February 1 transaction sets up a liability that should be valued at the present value of the future cash outflow that the issuer now assumes as an obligation. At the same time, recognition must be made of the present value of the $70,000,000 receivable due to the company on August 1. The interest rate in both cases is the 9-7/8 percent rate prevailing at the time of issuance.

Feb 1	Cash	$30,000,000	
	Installment Receivable on Note	$66,706,372	
	Notes Payable		$ 96,706,372

If the investor fails to make the necessary payment on August 1, the initial installment is forfeited, and a gain results.

Aug 1	Notes Payable	$96,706,372	
	Installment Receivable on Note		$ 66,706,372
	Gain on Forfeiture		$ 30,000,000

Due receipt of the second installment on August 1, on the other hand, leads to the removal of the receivable. In addition, interest expense must be recognized on the $96,706,372 liability at 9-7/8 percent for six months. This expense is partially offset by interest income on the receivable, also accrued at 9-7/8 percent.

Aug 1	Cash	$70,000,000	
	Installment Receivable on Note		$ 66,706,372
	Interest Income		$ 3,293,628
Aug 1	Interest Expense	$ 4,774,877	
	Interest Payable		$ 1,481,250
	Notes Payable		$ 3,293,627

Interest expense in subsequent periods under this approach would always reflect the interest rate existing at the time the notes were originally issued, rather than the rate prevailing on August 1 when the investors actually make their final commitment.

While the creation of offsetting accounts on both the balance sheet and the income statement might appear to be a trivial exercise, it does have implications for the calculation of financial ratios. The debt-equity ratio, for example, using the two-transaction approach, would be less than under the one-transaction approach, as would be the interest coverage ratios. Also, the installment receivable is a current asset while the note payable account is a long-term liability. An improvement in the perceived liquidity position of the firm is immediately noted.

The major distinguishing feature of the one-transaction approach is its early recognition as a liability of the entire obligation arising from the note. This could be criticized in view of the fact that this liability is contingent upon performance by the investor—the investor must pay the final installment in order to acquire the right to receive all the cash flows associated with the notes. (As discussed earlier, the probability of this event taking place is a function of the size of the first installment and the market rate of interest.) Yet the one-transaction approach is internally consistent in recognizing that the ultimate repayment of the $30 million and the ultimate repayment of the $70 million both depend on the same event.[3]

USING THE CONCEPTUAL FRAMEWORK TO SELECT A METHOD

To choose between accounting alternatives, it is necessary to have a set of criteria by which one of the alternative methods is shown to be superior to the others. The conceptual framework project of the

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[3] In response to this point, an argument for treating the $30 million initial payment as a liability presumably could be made that is independent of the likelihood of payment/default of the second installment. The initial payment creates a claim against the company for $30 million and accrued interest in the period prior to August 1 that may be enforced in the event of the issuer's bankruptcy.

Financial Accounting Standards Board (FASB) is intended to play this guiding role. The Statements of Financial Accounting Concepts (SFACs) are meant to set forth the fundamental concepts of financial accounting—"concepts that guide the selection of transactions, events, and circumstances to account for; their recognition and measurement; and the means for summarizing and communicating them to interested parties" (e.g., SFAC #3, p.i., FASB [1980b]). In the preceding section we presented two alternative approaches to accounting for deferred-payment notes. In the present section we consider whether the FASB's conceptual framework leads to favoring either one of these approaches.

One issue in accounting for the deferred-payment note relates to the recognition of the liability. SFAC #3 [FASB, 1980] devotes considerable attention to defining a liability and discussing its characteristics (paras. 28–42 in the Statement itself and paras. 124–143 in the Appendix, in particular). The three essential characteristics of liabilities are seen as being (para. 29): (a) a present responsibility to other entities exists that entails settlement by the probable future transfer or use of assets, (b) the duty or responsibility obligates the enterprise, leaving it little or no discretion to avoid the future sacrifice, and (c) the transaction or other event obligating the enterprise already has happened. An item lacking any one of these characteristics does not qualify as a liability (para. 100).

In the case of deferred-payment notes there is no doubt that the issuer has little discretion to avoid a future sacrifice. All discretion is with the investor. Once the investor pays the second installment, all the characteristics of a liability are clearly present in the issuer's obligation to make future interest payments and principal repayments. There is some question, however, as to whether this obligation of the issuer meets the essential characteristics of a liability at the time that the notes are originally issued. There seem to be two critical questions, namely, (1) has the transaction or event obligating the issuer already happened, and (2) is the future transfer of assets on account of this obligation actually "probable"?

The other issue in accounting for deferred-payment notes is the definition of an asset. SFAC #3 defines an asset (para. 19) as a probable future economic benefit obtained or controlled by the entity as a result of a past transaction or event. This definition is relevant in considering whether the borrower, having received the first installment from a subscriber, now has an asset in the form of the installment that is still receivable. As in the case of the liability definition, questions arise related to the probabilities of the anticipated outcomes and to the existence of a past transaction.

SFAC #3 (paras. 138–143) sees the occurrence of a transaction or event as being the factor that distinguishes between a present obligation (which may be a liability) and a future obligation (which is not a liability) of the enterprise. The occurrence of this transaction obligates the enterprise. The mere budgeting of payments for a machine whose purchase is planned, for example, does not obligate the enterprise to transfer assets in the future. Present obligations typically arise when funds, goods, or services are received from other entities, or when such obligations are imposed by outside entities like the government. Similarly, an enterprise has an asset only after a transaction or event has occurred that gives it access to and control over a future economic benefit.

Since the consummation of any exchange frequently is the final point in a whole series of events, the selection of the particular transaction or event that can be said to trigger the creation of a liability (or equivalently an asset) is judgmental. In the case of the deferred-payment notes, one could treat either of the two critical events—that is, either the receipt of cash from investors upon initial issue of the notes or the subsequent receipt of cash from investors as they choose to exercise their rights—as being the event that gives rise to the liability for the full amount of the note. The first event initiates the sequence and takes all discretion out of the issuer's hands. But it is the second event that determines whether or not there will ultimately be the realization of an asset and the incurrence of an obligation.

In the case of the asset, the question is whether the February 1 installment paid by the investor is an event that gives the borrower access to a future economic benefit in the form of the remaining amount receivable for the note. In issuing the note, the borrower clearly has initiated a sequence of transactions with investors that could result in the borrower receiving cash in the future. However, since the borrower's control of this benefit is contingent upon the investor's choice to acquire the note, it could be argued that no asset is created by this event.

Another question that arises in considering whether the obligation under the deferred-payment notes meets the SFAC #3 definitions of liabilities and assets relates to the probability of investors paying the second installment as scheduled. This particular issue seems to depend upon an assessment of the probabilities associated with the different interest rates that could exist at the time the second installment falls due. If the likelihood of the noteholder paying the second installment can be classified as "probable," it would seem that the entire amount of the note would qualify as a liability at the time of issuance, since the issuer must then meet interest and principal payments as scheduled. Correspondingly, the amount receivable in the second installment would meet the "probability criterion" for an asset.

According to SFAC #3, "probable" means "that which can reasonably be expected or believed on the basis of available evidence or logic but is neither certain nor proved" (para. 28, footnote 13).[4] This definition is clearly applicable to events having uncertain outcomes in which the probability associated with any single outcome is close to one. It is less clear in cases where other types of probability distributions exist. SFAC #3 does recognize that for its definitions of assets and liabilities to be applied in practice, degrees of probability need to be incorporated. This, however, is seen as a recognition or measurement issue (para. 40). The publication of Statement of Financial Accounting Concepts No. 5, "Recognition and Measurement in Financial Statements of Business Enterprises" [FASB, 1984], is intended to provide the needed criteria for asset/liability recognition. The recognition criteria in SFAC #5 are discussed later in this section.

Probabilities have been handled best in accounting when the event being accounted for consists of a large number of independent trials which have the same set of possible basic outcomes. In these cases the uncertain outcomes are represented in financial statements by their expected values. When products are sold on warranty, for example, the liability can be based on the expected number of returns. In contrast, when there is only one trial with two or more possible outcomes (e.g., as with a pending lawsuit), there has been a reluctance to use the expected value.

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[4] The Statement explicitly identifies that usage as the "general" meaning of the word "probable," rather than any "specific accounting or technical sense (such as that in Statement 5, para. 3)." Statement of Financial Accounting Standards No. 5, *Accounting for Contingencies,* categorizes the probability of a contingent event as "probable," "reasonably possible," or "remote," where "probable" means that the future event is "likely to occur."

Based upon the current definition of "probable," it follows that the entire obligation should be recorded as a liability (i.e., as in the one-transaction approach) if the likelihood of investor default is close to zero at the time of issuance. At the same time the amount receivable in the second installment should be treated as an asset. No liability or asset would be recognized if the likelihood of investor default is close to one. Both these scenarios are unrealistic. The Statement provides less direction in the more realistic case where none of the probabilities attached to the various outcomes is close to one.

Accountants traditionally have used a different probability criterion for assets from the one used for liabilities in following the dictum of conservatism. Conservatism has implied a reluctance to recognize an asset unless the future benefit is virtually certain, whereas liabilities are often recognized at lower levels of probability. There is an interesting conflict between these two tendencies in the case of executory contracts, such as in the case of deferred-payment notes, where offsetting assets and liabilities are involved.

In considering how the conceptual framework would guide the accounting for deferred-payment notes, it seems that SFAC #3 neither precludes the two alternative accounting approaches proposed earlier in this paper, nor suggests the superiority of either. The statement makes it clear that such matters as the degree of probability of a future economic benefit or of a future cash outlay are matters of recognition and measurement. The FASB's project on accounting recognition criteria was intended to bear more directly on how uncertainty should be handled in operationalizing the general definitions of the elements of financial statements [FASB, 1980b, para. 40 and footnote 17, para. 42].

The most recent articulation of the FASB's position on recognition issues is presented in the recent SFAC #5 [FASB, 1984]. A section of this Concepts Statement is devoted to specifying recognition criteria designed to make "definitions of elements of financial statements in Concepts Statement 3 operational in resolving financial reporting issues" (para. 61). An item that qualifies as an asset or a liability under SFAC #3 must meet three additional criteria—measurability, relevance, and reliability—in order to be recognized as such on financial statements.

Measurability refers to the ability to quantify the relevant attribute in monetary terms, relevance refers to the ability of the information to make a difference in user decisions, and reliability refers to the representational faithfulness, verifiability, and neutrality of the information. These definitions draw directly from an earlier part of the conceptual framework project, SFAC #2 [FASB, 1980a]. Unfortunately, none of these attributes provide guidance in resolving either the "multiple events" problem of the "degree of probability" problem. SFAC #2 appropriately had left these and other recognition and measurement issues to the recognition and measurement part of the conceptual framework project. It seems necessary for these issues to be resolved, or at least addressed more fully, before the definitions of the elements of financial statements can be made operational.

COCA-COLA'S TREATMENT

Coca-Cola chose to record the entire liability on February 1, 1983. A spokesperson for Coca-Cola indicated the following facts which further explain their decision. The issue was fully underwritten, i.e., the underwriters guaranteed to Coca-Cola that all $100,000,000 of the issue would be sold. In addition, Coca-Cola arranged to have third parties guarantee the August 1 installment. This agreement effectively eliminated any risk of forfeiture being assumed by Coca-Cola. If investors chose to default, the third-party guarantor would provide Coca-Cola with the necessary funds to complete the $100 million issue. Presumably, the guarantor would then attempt to find new investors to purchase the note at a discount.[5]

Since default and subscription risk had been transferred to a third party, Coca-Cola accounted for the issue using the one-transaction approach outlined earlier. Interestingly, Coca-Cola chose to net the $70,000,000 receivable against its current obligations on the grounds that the intended use of the funds was to reduce the short-term debt. This treatment effectively reclassified $70,000,000 of short-term debt as long-term debt on February 1, 1983. The $30,000,000 in cash received was used to retire short-term debt.

CONCLUDING REMARKS

The alternative methods for accounting for deferred-payment notes presented in this paper arise from different interpretations of the transaction. Each interpretation describes an aspect of the economic reality underlying the bond issue, but not all aspects. The choice of one preferred accounting method might reflect the aspect of reality that one chooses to emphasize, rather than the inherent superiority of any one accounting principle over another.

We suggested two approaches to accounting for deferred-payment debt issues. One approach treats the issue as being composed of two transactions, the first of these transactions being the exchange for cash of the right to acquire the note, and the second the purchase of the note itself. A second approach takes the position that there is only one transaction, which is the sale by the company of a note, partly for cash and partly for a promise. The conceptual framework project of the Financial Accounting Standards Board was referred to, in an attempt to find criteria that would aid in the selection of a preferred accounting method, but the established definitions proved difficult to make operational. It would seem necessary for the FASB to come to grips with issues relating to uncertain outcomes and multiple events before the Concepts Statements can begin to provide useful direction for accounting policy formulation.

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[5] The practice of insuring the risk of default does not appear common for deferred-payment notes, but rather, a special arrangement which Coca-Cola had contracted.

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BOOK REVIEWS

Harvey S. Hendrickson, Editor

EDITOR'S NOTE: Books for review should be sent to Professor Harvey S. Hendrickson, School of Accounting, College of Business Administration, Florida International University, Miami, FL 33199.

(The policy of the *Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.)

A. RASHAD ABDEL-KHALIK, Principal Researcher, *Financial Reporting by Private Companies: Analysis and Diagnosis* (Stamford: Financial Accounting Standards Board, 1983, pp. viii, 155, $15.00 paper).

This research study, supported by the FASB, uses interviews and survey research to examine the issues related to the application of generally accepted accounting principles (GAAP) by private companies and the possibility of allowing differences in the principles governing reporting by private and public companies. It is the first comprehensive study to provide detailed empirical data relevant to the "Big GAAP"—"Little GAAP" debate.

The findings of the study show that managers, bankers, and public accountants working with private companies differ in their perceptions of the costs and benefits of GAAP-based financial statements. In turn, they differ in their attitudes toward the development of a special set of GAAP for small private companies. Statistics reported in the study indicate that bankers find GAAP-based statements useful for decision making and favor the continued reliance of all companies on one set of GAAP. But accountants question the complexity and relevance of certain standards (e.g., leases, deferred taxes, and pensions) and believe that the development of a special set of GAAP would be beneficial. The opinions of managers vary.

The report that provides the data to support these and other conclusions is divided into five chapters and two appendices. The first chapter summarizes the overall findings of the research, briefly describes the research design, and reports the results of the study in terms of nine questions basic to the "Big GAAP"—"Little GAAP" debate. The pairing of questions and findings is an effective way of organizing and communicating the results of the study to practitioners and other readers with limited time. Because of the format and readability, this chapter is likely to be read and cited more than the other chapters.

The remaining chapters are organized according to the sequential steps followed in doing the research—(2) literature review, (3) structured interviews, (4) survey questionnaires, and (5) follow-up interviews and statistical tests. Reading these chapters confirms that the research was designed carefully and that the first chapter accurately summarizes the study's findings. Examination of the questionnaires contained in the appendix shows that they required considerable accounting knowledge on the part of the respondents. This helps to explain the relatively low response rate for randomly selected managers (19 percent) and underscores the need to keep the levels of response in mind in attempting to generalize from the study.

Chapters 2–5 also will be relevant to anyone considering the use of survey research techniques. They illustrate and discuss problems that are encountered and limitations that must be considered in conducting this type of research. For example, a comparison of the responses of a random sample of managers and a sample of managers volunteered through chapters of the National Association of Accountants (NAA) provides a good illustration of the effects of self-selection on response.

This study will be of interest to practitioners and academics concerned with the "Big GAAP"—"Little GAAP" debate. It also will be useful as a case study in survey research for accounting students.

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ROBERT N. ANTHONY, JOHN DEARDEN, and NORTON M. BEDFORD, *Management Control Systems,* Fifth Edition (Homewood: Richard D. Irwin, Inc., 1984, pp. xiii, 853, $32.95).

The fifth edition of this well-written text and case book in management control systems (MCS) has easier-to-read type and continues the basic format of the fourth edition (reviewed April 1981, pp. 410–411) as a revised, amplified version. It adds a new co-author, Professor Norton M. Bedford.

The entire text has been rewritten to incorporate recent literature and observations from practice with major revamping of Chapters 1-4, 14, and 17 along with considerable expansion except in Chapter 4. The end-of-chapter suggested readings have been increased substantially so that all but three chapters contain references. Also, several footnote citations appear in most chapters. One appendix, ZBB, has been deleted without detriment; one new appendix aptly illustrates SFAS No. 52 for the chapter on multinational companies.

A continuing forte is extensive cases. A net increase of six cases resulted from 14 additions and eight deletions. Thus, one-fifth of the 68 cases are new with seven chapters each offering at least one new case. Each chapter, other than 1, 3, and 6, now supplies at least three cases. Fortunately, classic cases illustrating nuclear management control system issues and concepts are retained. Despite this, an instructor may continue to direct student analyses of some cases with supplemental or replacement questions for more effective classroom presentations.

The balance between text and cases has not been altered from the fourth edition. But, due to the fifth edition's substantial expansion, the text material appears to be quite adequate for a one-semester course in MCS or for a course in controllership featuring MCS as the key component of the controllership concept. The book provides a basis for a logical, challenging, practical, and useful study of management control for MBA students and for master of accountancy students desiring an administrative rather than quantitative orientation to accounting.

The book is most appropriate for students who have had a course in management accounting. While the authors state that few of the cases require a detailed knowledge of accounting, the reviewer's experience has been that a strong prerequisite course in managerial accounting and/or real-world experience is an advantageous and meaningful backdrop for analyzing the cases and more fully appreciating the administrative control issues discussed in the text.

The text is not designed for a course in advanced cost accounting but for an in-depth study of management control theory, issues, problems, and systems design. Its intent is to elevate accounting beyond pure quantitative analysis to administrative control issues for a variety of entities. (The chapter on nonprofit organizations near the end provides stimulus for students interested in a follow-through course in management control for the nonprofit sector, also using the case approach.)

Effective pedagogy still is developing for teaching management control. Aids are found in the *Teacher's Guide:* (1) Each case is prefaced with its objective(s) for the assignment; and (2) the authors' classroom experience with each case is shared to illustrate some successful ways in which the case has been handled, although discussions of broad cases never repeat identically in different classes. Instructors who are uncomfortable with the case method will not enjoy its pedagogy. But for those who are willing to use or experiment with it, the Introduction in the *Teacher's Guide* provides some guidance on the different but dynamic experience of teaching design of an MCS via the case method. The authors openly admit to a difficult, occasionally frustrating, but nevertheless fascinating subject.

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BHABATOSH BANERJEE, *Financial Policy and Management Accounting* (Calcutta: The World Press, Pvt. Ltd., 1984, pp. x, 750, Rs. 42.00, £3.50, $6.00 paper).

This book attempts to bring together financial management and managerial accounting under one umbrella. Because of the considerable common ground, efforts at this integration are welcomed.

This book is aimed primarily at those preparing for accounting examinations in India. It is divided into 14 chapters, each of which contains numerous worked-out examples, followed by many discussion questions and exercises. Answers to numerical exercises appear at the end of the book. The author provides frequent discussions of statutory requirements for financial reporting and practice in India, and the relevance of theory to Indian conditions.

Some of the highlights of the book are:

- The chapter on working capital management includes a good coverage of inventory control often missing from many books on accounting or finance. Another interesting feature is the use of inventory models for determining an optimal cash balance, and a good description of various kinds of cash floats.

- The most interesting feature on the subject of long-term capital structure is a simultaneous discussion of operating and financial leverage, and how closely they are linked together.

Some of the important shortcomings of the book are:

- The introductory chapter explores views of different authors about the meaning of management accounting. But two ideas that are presented should not go unchallenged. The first is that the objective of a business is profit maximization. As Drucker and others have stated, this concept is not only meaningless, it can even be harmful. The second is the implicitly erroneous notion that management accounting is concerned merely with efficiency —not with effectiveness.
- In a discussion of funds flow analysis the author takes the position that depreciation is a source of funds! The seeds of this are either the models often used in finance in which the tax effect of depreciation is viewed as a cash flow or the anachronistic thinking that cash flow is merely an extension of the accrual accounting concept of profit, rather than a powerful indicator in its own right. Because of this, the material lacks a clear discussion of some key issues, such as (1) the superiority of cash over the working capital concept of funds, and (2) the conceptual advantage of the "direct" over the "add-back" method.
- In discussing capital budgeting the author first assumes a state of certainty in the general tradition of writers in finance. But uncertainty is the major problem in the real world and cannot be assumed away. The mathematical models the author invokes later also are of little help, and can not be a substitute for managerial judgment and courage in decisions of this type. Another weakness that this presentation shares with traditional approaches is the failure to see capital budgeting in a strategic context, i.e., the effect on relative competitive ability of a decision *not* to invest.

Notable omissions from the book are a comprehensive discussion of different cost concepts, behavioral and more advanced aspects of responsibility accounting (e.g., transfer pricing), and product cost accounting.

In summary, while the book generally is strong on financial management, it has some important gaps in management accounting. But a single text that does justice to both disciplines is an extremely tall order. On the other hand, it considers the important topics of inflation and funds flow that generally are in financial accounting. The author deserves credit for attempting an ambitious task.

Although closely related, management accounting and financial management generally have remained separate disciplines in the United States. This book represents a major departure from this tradition and sets a good example for future efforts of this kind. The book can be useful as a library reference source for those interested in international accounting.

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AHMED BELKAOUI, *Socio-Economic Accounting* (Westport, CT: Quorum Books, 1984, pp. xii, 324, $29.50).

This book exposes the reader to a new approach to socio-economic accounting. It provides a mix of the conceptual and the pragmatic, though it definitely is not procedurally-oriented. One-third deals with three socioeconomic accounting paradigms, another third with micro and macro social accounting approaches, and the balance essentially with social auditing and the economics of social issues.

According to the author, socioeconomic accounting encompasses at the micro level social accounting and social auditing, and at the macro level social measurement, social accounting, and accounting for economic development. The three main paradigms analyzed are as follows. The economic paradigm reflects a statement of national and social goals based on social welfare and justice. The rectification paradigm views the corporation as an active social agent whose performance can aggravate or ameliorate social conditions. The ethical paradigm focuses on corporate social involvement in general.

Comprehensive coverage is given to the principal recommended social accounting and auditing approaches that have appeared in previous literature both in the United States and abroad. But what is not clear is how the alternative social accounting and auditing approaches relate to the various paradigms on which the book is based.

Some confusion is caused by presenting the evolution of socioeconomic accounting thought in piece-meal fashion over various chapters, particularly those dealing with the three paradigms, rather than all in one chapter. In addition, it is unclear whether the social accounting and auditing approaches examined in the book evolved from earlier work and, if so, to what extent. The historical perspective presented by the author has some omissions. For example, D. R. Scott is not mentioned. The author fails to analyze the environmental changes that have created the need for socioeconomic accounting. No consideration, let alone assessment, is given to the fact that social accounting applications have not progressed in recent years in the United States as opposed to Europe, where in several countries such as France corporate social disclosure has become mandatory or customary. Furthermore, for a book of this kind, insufficient space is devoted to the value-added reports prepared abroad.

Particularly commendable is the book's interdisciplinary approach, especially its coverage of the social economics literature. Accordingly, the book conceivably may be appropriate for interdisciplinary graduate seminars. Although not primarily a textbook, it could be used as such, but it has no end-of-chapter questions, cases, or problems. All in all, this book provides the up-to-date synthesis of socioeconomic accounting that is needed in the academic world and beyond.

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BRYAN V. CARSBERG and MICHAEL J. PAGE, Editors, *Current Cost Accounting: The Benefits and the Costs* (London: Prentice-Hall International in association with The Institute of Chartered Accountants in England and Wales, 1984, pp. xviii, 484, the four-volume set £28.00, $42.00).

This is an interesting collection of research reports which explore the costs and benefits of current cost accounting (CCA) in the context of the U.K. CCA was introduced in 1980 with the adoption of Statement of Standard Accounting Practice No. 16 (SSAP16). This system required a comprehensive supplementary report incorporating full income and financial position statements with adjustments for monetary working capital and gearing as well as cost of sales and depreciation. The SSAP16 experiment was to be reviewed in 1983 and revised if necessary. Accordingly, all of the major professional accountancy bodies commissioned research studies as a part of this review and the question of whether CCA should be rejected or continued in its existing or a modified form is currently a matter of controversy and debate. This publication reports on those projects forming the research program of The Institute of Chartered Accountants in England and Wales, directed by Professor Carsberg, together with an extensive survey of companies preparing CCA information commissioned earlier but relevant to the inquiry.

Before commenting on the substance of the reports, a note should be made of their somewhat curious form of publication in four booklets. This separation has no stated or obvious rationale. It also is inconvenient, particularly when attempting to cross-reference research reports with the overall summary and analysis of findings.

The first booklet includes Carsberg's report on the findings of the research studies together with a summary of conclusions. The second booklet includes studies on the use of CCA in the press and in stockbrokers' reports, by institutional investors, by stockbrokers for investment analysis, in government, and in management accounting. Also included are studies on the reliability of special CCA measurements, e.g., under technological change, the cost of preparing current cost accounts, and the availability of data for CCA. The third booklet includes a series of related studies on the relevance of CCA to share prices and the market's reaction to CCA disclosures together with the effect of CCA on published results compared to historical cost. The fourth booklet reports on a single research study on the implementation of CCA by companies and covers both external reporting and management accounting.

These studies provide a wealth of interesting and valuable material relevant to the CCA debate, both within and beyond the U.K., that will assist policymakers. At the same time, many of the findings are highly tentative. Major weaknesses include the use of very small sample sizes in a number of cases, e.g., in the share price reaction studies, in the effect of CCA on published results, and in the use of CCA information by stockbrokers. The limited time scale of many of the studies is another restriction on the significance of the findings. The main reason for these problems is that the deadline for the completion of the research was tight. This is perfectly understandable, but it means that many of the findings should be treated as providing little more than insights. Carsberg recognizes this when he says that the research "cannot be expected to yield a definitive conclusion. It is likely to move the debate forward and to narrow the areas of disagreement but it is unlikely to lead to the position in which one accounting method can be identified with certainty as the best" (p. 71).

The search for a single answer is likely to be unrealistic in any event given the existence of different circumstances, objectives, and uses of information in an inflationary context. Besides the fact that the research results often are incomplete or inconclusive, Carsberg also points out that costs are more easily measured than benefits with the result that judgments of cost-benefit relationships become very difficult. Furthermore, he argues that in making any final judgments it should be recognized that CCA is a new system involving a difficult learning process. With these considerations in mind, Carsberg takes a positive overall view of the research which he says "has demonstrated a surprisingly extensive use of current cost accounting information" (p. 73). Certainly CCA has some use, mostly supplementary, but whether this is a sufficient indication of usefulness to justify its continuation remains open to question. But in Carsberg's judgment the evidence of use, the suggestion that problems of reliability and cost are not overwhelming, and the strategic importance of the inflation accounting issue to the profession lead to the conclusion that CCA should be continued but not necessarily in the same form as SSAP16. His ideal system is one which includes a distributable profits statement based on CCA and the maintenance of operating capability together with a total profits statement that includes all holding gains, realized and unrealized, corrected by a general purchasing power adjustment to equity to maintain financial capital.

In summary, these research reports are required reading for researchers in inflation accounting. They certainly will be useful as supplementary material in postgraduate courses, especially doctoral programs. Hopefully they also will be consulted by policy-makers, as there are many interesting and important issues explored in this area of continuing debate.

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A. Charnes and W. W. Cooper, Editors, *Creative and Innovative Management: Essays in Honor of George Kozmetsky* (Cambridge, MA: Ballinger Co., 1984, pp. xxxi, 268, $25.00).

This collection of 18 papers, in the form of seven chapters and 11 commentary articles, deals with creativity and its place in education and management, innovation in public sector management, changing approaches to accountability, creative management in mature industries, risk management, and academic research in psychology and artificial intelligence. Collectively, Professors Charnes and Cooper provide in this assembly an appropriate recognition of the wide range of interests entertained by George Kozmetsky over much of his professional life.

The book is not a textbook in the conventional sense. Nor is it a practical guide for the harassed manager attempting to "meet the payroll." But for the researcher, educator, or manager attempting to gain insights into the process of developing creativity and innovation, it provides a sense of direction, illustrations of apparent creative and innovative actions, and a survey of psychology and computer research related to creativity.

Possibly the most creative part of the collection of essays is George Kozmetsky's proposal that the university of the future should develop and teach a new discipline of creative and innovative management. To accounting academics, his association of the creative and innovative discipline with a broad information base and Elmer Staats' illustration of the creative and innovative expansion of the audit function represent inspirational goals for the future structure, scope, and content of accounting education and research.

The French (B. Collomb and J. P. Ponssard) illustration of the inadequacy of portfolio approaches to strategic management, as proposed by the Boston Consulting Group, is not convincing though it represents a creative emphasis on the need to avoid the routine mechanical use of the portfolio approach. Some readers may be left with a sense of frustration because of the lack of guidance on when the portfolio approach should be questioned and a creative effort made to deal with an organization's problems.

The association of risk with uncertainty in the business environment and Karl Faxen's rather convincing evidence that uncertainty in economic life has increased significantly over the past two decades is well worth reading. Associating that uncertainty with the macroeconomic system rather than the conditions within individual businesses represents an illustration of the creative problem identification process. Bertil Näslund's explanation of the reason for the increase in economic turbulence and management techniques used in dealing with the resulting uncertainty provides a good description of creative risk-management efforts.

Other chapters and attached "commentary and counterpoint" all bring something of interest to the collection. For example, most readers will be impressed with Allen Newell's analysis of the role of the computer as a tool rather than as a direct help in creative management.

Overall, the book was a bit disappointing. Many of the intuitive suggestions and case study illustrations were not based on empirical research, though the quality of the authors suggests the material presented was based on a wealth of personal professional experience. Nor are the different chapters closely related, as would be the situation if one author had written the entire book. As a consequence, the collection does not span the entire field of creative and innovative management. Possibly I expected too much from the book. While Wayne Holtzman recognized that most of the research in the field of creativity has revealed a fairly stable set of core personality characteristics related to creative achievement and activity, his subsequent disclosure that no one has developed a good psychological test for predicting managerial creativity left me a bit disappointed.

In a sense, the publication of the book for general-purpose use may be premature. There is general awareness of the need to educate managers so they can adapt to the many changes taking place in society. But the collected picture the book presents of innovative management techniques does not educate students to be innovative managers. Probably too much of the book deals with common knowledge, though some of the illustrations of changes in ways of doing things (accountability, cement industry, risk management, ZOG) reveal innovative applications of that knowledge.

Possibly the intended contribution of the book is to emphasize the need for universities to start dealing with the task of developing the ability of students to adapt to change, and even to induce change when an overall benefit accrues to society. The book does this in an excellent fashion.

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LANNY G. CHASTEEN, RICHARD E. FLAHERTY and MELVIN C. O'CONNOR, *Intermediate Accounting* (New York: Random House, Inc., 1984, pp. xxvii, 1,148, $38.00).

A welcome addition to the intermediate accounting textbook arena is a new one by Chasteen, Flaherty, and O'Connor. The authors assert that a distinguishing feature of their text is its readability (p. ix). This objective has been achieved. The wording generally is clear and concise; few instances of ambiguity or multiple interpretations exist.

In addition to readability, a major strength of this text is that many of its chapters use conceptually oriented introductions that provide the reader with an overall appreciation of the accounting issues associated with a particular topic. Good examples are the chapters on leases and pensions. Both chapters begin with simple yet insightful examples which are used to illustrate and explain the major accounting alternatives. This is done before the detailed APB and FASB rules are reviewed. Thus the reader is in a better position to evaluate current GAAP. In addition to employing fundamental concepts to evaluate current practice, the authors also use arguments based on economic consequences and political lobbying to explain the development of current practice. Their treatment of troubled debt restructuring is a good illustration of this. While attention has been paid to conceptual understanding, the text sacrifices little procedural detail. Although some books do contain more detail, the differences generally are minor.

Another strength of this book is the internal structure of many of the chapters. Concepts are introduced in an orderly, easy-to-understand, integrated sequence. Each section prepares the reader for the next.

The coverage of this book is similar to that of most other intermediate texts. Organizationally, the book departs in only a few respects from the typical presentation. Entire chapters are devoted to 1) revenue recognition and 2) earnings per share. Investments in bonds and bonds payable are treated in one chapter. Since the same concepts underlie the accounting treatment for both, efficiencies in classroom coverage should result. As with most intermediate texts, after the first seven chapters or so have been reviewed, many of the other chapters can be covered in the order desired by the instructor.

This, like all books, has some shortcomings. The authors allege they have "thoroughly" (p. ix) integrated the conceptual framework material throughout the text. While the conceptual framework is reviewed adequately in Chapter 2, and it is used in some instances to evaluate current practice, a number of chapters make no mention of the framework. Several errors in exhibits were noted and a number of errors also were found in the solutions manual. The chapters devoted to inventories contained some confusing exhibits and were somewhat light on procedural detail. The chapter on changing prices, while thorough, is rather redundant and contains too many (33) exhibits.

The end-of-chapter problem material spans a wide range of difficulty, but does not contain sufficient coverage of some topics. For example, no problem addresses interest capitalization on self-constructed assets and only one problem requires journal entries for long-term construction contracts. Also, the number of multiple-year, long-term construction contract problems and multiple-year, dollar-value LIFO problems is limited. A full array of supplemental materials is available for students and instructors.

Despite a few first edition problems, this is an excellent text. It is well written, well organized, and effectively communicates the material. It is as conceptually oriented as almost any other text, yet it contains a more than adequate amount of procedural detail. This combination makes it one of the most comprehensive and balanced texts currently available. It deserves the serious consideration of anyone who teaches a rigorous intermediate financial accounting course.

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PHILIP CREIGHTON, *A Sum of Yesterdays: Being a History of the First One Hundred Years of the Institute of Chartered Accountants of Ontario* (Toronto: The Institute of Chartered Accountants of Ontario, 1984, pp. xxiv, 360, Can. $50.00).

This handsome book is an excellent example of what an institutional history should and can be. Even though the book is replete with color plates and the requisite photographs of every president and other dignitary of the organization since day one, it does tell the story of the Institute in a straightforward, frank, and interesting manner. That is due, no doubt, to the happy coincidence that the author is both a trained historian and a Chartered Accountant. Furthermore, judging by the results of his work, it would seem that Professor Creighton was given full access to all minutes and other documents of the Institute and other relevant organizations, and then was allowed to write his interpretation of events, without undue interference from anyone.

The book traces, in more or less chronological order, the various facets common to most organizations, such as start-up pains, membership, and growth, and the more particular issues of an accounting society, i.e., standards, education, and training of students. A great deal of the narrative is taken up with the internecine battling between the Institute and other accounting bodies. Almost equal time is given to the Certified Public Accountants Association of Ontario, a group that eventually merged with the Institute, with lesser space being devoted to the Certified General Accountants, the Society of Management Accountants, and others too numerous to mention. These still unsolved battles play so large a part in this history that the subtitle of the book could almost have read *The History of the Accounting Organizations of Ontario.* Other refreshing insights that usually don't appear in a commissioned history are the antisemitic stance of some of the membership as well as the chauvinistic attitude towards women, although in all fairness, these aberrations were not unique to the Institute. By the same token, the fuss caused by the dating of the centenary is not ignored.

All in all, the picture that emerges of those who made and make up the Institute is that of a prosaic group of people trying to further its own ends while preaching the virtues of public service. In this, it is sad to say, accountants are no different than the practitioners of any other profession, but unfortunately not even one individual can be singled out as a heroic figure worth looking up to. Since this type of person occasionally appears in the other professions, such as law and medicine, it is possible that accountancy does not lend itself to such a personage, or maybe the profession is not as yet mature enough to have spawned one.

Philip Creighton has given us a book that all Canadian accountants should read. The profession is still fighting many of the battles chronicled in its pages, particularly the proliferation of organizations each going its own way. The author has fulfilled his avowed purpose of writing a history of the Institute and trying to interpret the whys and wherefores of what transpired. It can only be hoped that the powers-that-be read the book and learn from the past, since many of the old problems are yet to be solved. After all, isn't that what history is all about? To not compound the errors of the past.

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EDWARD B. DEAKIN and MICHAEL W. MAHER, *Cost Accounting* (Homewood: Richard D. Irwin, Inc., 1984, pp. xxiii, 1,003, $32.50).

The primary objective claimed by Deakin and Maher for their new cost accounting text is to overcome the lack of cohesive topic organization found in most existing cost and managerial accounting texts. Judged solely by this criterion, the authors effectively achieve their objective. They do so by structuring the text into three major topic areas: (1) cost accounting systems, (2) differential costs for decision making, and (3) cost data for performance evaluation; and by dealing only with related topics in each area. This interwoven pattern enables the reader to tie related material together, thus avoiding the feeling of jumping around or being pulled in every direction usually pervasive in most cost accounting texts.

This book has 26 chapters. The first two present an overview of the field of cost accounting. The last three, which constitute Part 4 of the book, cover the impact of uncertainty on cost analysis and serve to set the discussion in earlier chapters in a real-world environment.

Part 1, cost accounting systems (Chapters 3 through 9), deals with cost accumulation, cost allocation, job order and process costing, joint product costing, and variable costing. Except for the caution that "allocated cost can be misleading" for decision making (p. 98) and for joint cost and process-further decisions (p. 274), the authors limited their discussion in this part to the question of how to generate cost data by using the formal accounting recording system for inventory valuation and income determination.

Part 2, differential costs for decision making (Chapters 10 through 16), explains how differential cost concepts, CVP analysis, statistical and mathematical models, and other approaches can be used by the accountant to gather and select relevant cost data to help management in making various short- and long-run decisions. By excluding irrelevant material from this part, the authors did a very good job in presenting all possible decision problems.

Part 3, cost data for performance evaluation (Chapters 17 through 23), relates to how tools such as the master budget, the flexible budget, standard costs, variance analysis, and responsibility accounting can help management to compare predetermined data with feedback data from actual operations to measure the effectiveness and efficiency of both manufacturing and nonmanufacturing performance. Except for the standard cost system (Chapter 20), which deals with the formal accounting recording system, the authors did limit other material in this part to performance evaluation and control. Furthermore, the authors aptly caution the reader about the difference between standard costs and a standard cost system.

The individual chapters also are well structured. Each chapter begins with a statement of objectives. General and specific discussions then are followed by ample diagrams and illustrations. The diagrams are very effective tools, demonstrating in pictorial form what the authors are trying to say in words. Each chapter ends with a summary, a list of concepts and terminology, and at least one self-study problem which reinforces the material presented in the text. There are ample questions, exercises, problems, and cases at the end of each chapter to be selected for homework. Some of the assignments are challenging yet solvable, while others are simple but still illustrate the concept well. As an added plus, the text is accompanied by a package of useful learning aids that includes a study guide, test bank, instructor's manual, and check figures.

The clear and concise writing style is another good feature that makes the book very readable and at no time discouraging to the reader. The chapters are relatively short, averaging about 20 pages. But this brevity is a mixed blessing; while maintaining the reader's interest intact, it does sacrifice in-depth discussion. As an example, the discussion on accounting for by-products (pp. 275–276) is overly simplified without mentioning changes in inventory of main products or by-products. In-depth discussion also is lacking on processing decisions and joint costs (pp. 274–275) and cash budgets (pp. 638–639).

In discussing cost systems, the authors emphasize the cost-flow concept by tracing the cost flows through T-accounts in at least 40 examples. Some examples may help a few students, but generally they are either of little use or confusing. Illustrations 3-3 (p. 55), 5-2 (p. 127), and 8-3 (p. 269) are examples too simple to be of any value to the student who has had one semester of study in accounting. Examples of confusing illustrations are 5-6 (p. 135) and 20-5 (p. 762), because the T-accounts in these examples have so many arrows going in every direction that they are hard to follow.

Illustration 20-10 (p. 769) on summary of variance proration is a good visual aid. However, an error was made in not prorating the material price variance to material efficiency variance. The title "System Choice: Job Costing versus Process Costing" (pp. 195–198) is questionable because neither the accountant nor anyone else can choose between job or process costing. It is the nature of the business operation which dictates the method to be used. Actual costing and normal costing are introduced clearly and compared beginning on page 139. But in Chapter 9 a lengthy discussion and comparison between actual costing and normal costing again is made in connection with a comparison of absorption costing and variable costing, thus rendering the discussion unduly complex (pp. 292–304). The book has plenty of appendices, but some of them are important enough to be moved into the body of the text. One example is Appendix A in Chapter 19 (pp. 726–727), dealing with production volume variance of fixed manufacturing overhead.

As in most introductory cost accounting texts, the authors lean toward a procedural rather than a conceptual approach. In spite of a few isolated deficiencies, this text is an excellent addition to the current offerings in the field. This book is very effective and appropriate for an undergraduate cost accounting course, particularly for those who prefer the "learning by doing" approach. The authors should be commended for their worthy effort in producing a comprehensive, uniquely organized, and clearly written text.

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DAVID FLINT, Editor, *Symposium on Auditing Research: 1982,* Research Symposium No. 1 (Glasgow: University of Glasgow Press, 1983, pp. x, 107, U.K. £4.50, Europe £5.00, U.S. $5.00).

This book is a collection of papers and discussants' comments presented at a conference at the University of Glasgow in Scotland in April 1982. The objective of the conference was to stimulate auditing research rather than to present and discuss examples of auditing research. The papers reflect that objective. The presenters, discussants, and attendees represented a mixture of Scots, academics, and practitioners, and also included Professor Gary Biddle from the University of Washington. This book is stimulating reading for those interested in auditing research. While most of the ideas in it are not new to those familiar with the development of auditing research in the United States, many of the ideas are presented with new insights, and the book as a whole provides an unusual opportunity to acquire some perspective on the differences in auditing research in different cultures.

The body of the book is in many respects comparable to the published proceedings of audit research symposia held here in the United States, such as those held at the University of Illinois and the University of Kansas. This proceedings has five contributed papers, the first four of which are followed by discussants' comments. The first paper by Professor David Flint, of the University of Glasgow, and the second by Mr. Bryan G. Blackborn, of Deloitte Haskins & Sells, have the same title, "The Scope for Auditing Research." These two papers are broad calls for basic auditing research in the United Kingdom. Some common threads of thought in these two papers include the need for research on public expectations of auditors, the bases of the opinion an auditor expresses, and other aspects of public expectations. While these two articles are quite effective in laying out general topics for needed auditing research and seem to do so with good justification for the topics selected, neither article pushes the general topic areas to the level of researchable questions.

The third paper, "Decision Making in Auditing: Alternative Research Strategies," is by Professor Gary Biddle, who was invited to provide a U.S. perspective on auditing research. Professor Biddle's paper is not a detailed analysis of auditing research in the United States. Rather it is a very good quality analysis of research methodology and research design, especially focused on auditor judgment processes. While somewhat narrow in focus, its quality makes the purchase of this proceedings worthwhile. The article includes brief but well thought out discussions of some of the dimensions of auditing research strategies including the normative-descriptive dimension, analytical-empirical dimension, and true experiment versus *ex post* analysis. The research method described follows the usual classifications of lens model, probabilistic judgment, and predecisional behavior. But these three classifications are especially well-described in succinct, readable language.

The fourth paper was presented by Mr. David J. Hatherly, Director of Accounting and Auditing Research, The Institute of Chartered Accountants of Scotland. The paper, "The Role of the Systems Examination in Substantive Testing," includes a number of interesting points including an analysis of the AICPA audit risk model and its sensitivity to the accuracy of auditors' probability assessments and to the level of detail to which these probability assessments are carried. In addition, he considers explicitly the reliance on internal control systems that are implicit in carrying out substantive tests of details. While the points made are of considerable interest, most of the issues raised in the article have been made by this author or others elsewhere.

The last paper, "Shareholder Protection and the Auditor: Some Issues," by Professor Robert Jack, is an analysis of the legal environment of public auditors in the United Kingdom. U.S. academics should find this article very interesting since it makes very clear that the two auditing professions have significant differences that are not only of interest in their own right but also potentially important in designing auditing research.

The proceedings of this symposium are very worthwhile reading for those interested in acquiring some understanding of the public auditing profession and the current status of auditing research in the United Kingdom. Whether the symposium achieved its desired objective of stimulating auditing research in Scotland is an empirical question, but there's no doubt that holding a symposium of this type is a step in the right direction.

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DAVID A. R. FORRESTER, Editor, *Frank Sewell Bray—Master Accountant 1906–1979: A Selection and Assessments of His Work* (Glasgow: Strathclyde Convergencies, 1982, pp. iv, 141, £9.00).

This volume is a memorial to an English accountant and intellectual, who in an uncongenial period sought to impart to his profession a concern for fundamental ideas which it lacked, and which it was not to acquire for many years.

During the 1940's and 1950's, Frank Sewell Bray combined professional competence (as a partner in a large London accountancy practice) with evangelistic concern to promote theoretical research in his discipline. As a part-time fellow at Cambridge under Sir Richard Stone, he contributed to the work on macro-accounting which in 1984 gained Stone the Nobel Prize for Economics. A leader of the Society of Incorporated Accountants, Bray was founder and editor, with Leo Little, of its quarterly *Accounting Research* (1948–1958), then Britain's only academic journal in its field. In 1952 the Society appointed Bray to its new Stamp-Martin Chair of Accounting, the only one in the U.K. outside a university. By 1957 his reputation had reached its apogee. Then the Incorporated Accountants merged with the three Institutes of Chartered Accountants (English, Scottish, and Irish). The practitioner-dominated English Institute took over the monthly journal, *Accountancy,* but abandoned *Accounting Research* and the Stamp-Martin Chair. Bitterly disappointed, Bray concentrated on his practice. A Roman Catholic, he received a Papal knighthood in 1960. He died in 1979, aged 72.

Such is the substance of Professor R. H. Parker's short biography in the first part of the book. The bulk of the volume consists of long extracts from Sewell Bray's writings and lectures, giving a good cross-section of his main interests. He began by arguing for fuller disclosure in financial statements, and went on to advocate standardized company accounts, fitting into a coherent framework of national accounts on the Franco-German model. This, he thought, would greatly improve British economic management, and ensure automatic comparability of all micro-accounting statements. He also took an interest in management accounting and price-level adjustments. Though not gifted with any remarkable graces of style, and prone to lapse at times into jargon, Bray generally was able to hold his reader's or audience's attention and to set out his arguments lucidly. Today most of his work appears old-fashioned, especially in relation to uniform accounting. The U.K. has refused to go down this road, and has followed the U.S.A. in developing user-oriented financial statements, while national accounts are compiled from data obtained from other sources. The European Economic Community has compelled Britain to adopt standard formats of accounts, but these were drawn up after the U.K. joined the EEC, and are designed to give a "true and fair view" in the Anglo-Saxon tradition.

This book is a monument to a pioneer of British academic accounting who came before his time and achieved less than he might have done later. Circumstances were against him, and subsequent developments were to take a different path. Frank Sewell Bray's influence is limited today, but he is undeniably of lasting interest. Mr. Forrester's work is warmly recommended to all serious students of accounting history.

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HORTENSE GOODMAN and LEONARD LORENSEN, *Illustrations of Accounting for Enterprises in Unusual Circumstances and Reporting on Them by Independent Accountants* (New York: American Institute of Certified Public Accountants, 1984, pp. viii, 147, $9.50, paper).

This publication is the 28th in the AICPA's series of Financial Report Surveys. It is a compilation of examples of the accounting for and reporting of three classes of enterprises in various stages of unusual financial uncertainty. While the use of the phrase "Enterprises in Unusual Circumstances" in the main title is not particularly descriptive, the subtitle "A survey of troubled enterprises, reorganized enterprises, and liquidated enterprises" explains the focus of the survey.

The survey includes financial statements and excerpts from financial statements as well as the corresponding reports of independent accountants for 21 companies. The illustrations were selected from more than 8,000 published annual reports stored in the National Automated Accounting Research System (NAARS) of the AICPA.

The text is divided into five chapters followed by one appendix. Chapter I provides the introduction including the scope, purpose, and general definitions. Several related, authoritative financial reporting pronouncements are listed for reference purposes, and the sources of the illustrations are described. Appendix A is a reproduction of SAS No. 34, "The Auditor's Considerations When a Question Arises About an Entity's Continued Existence." Chapters II–V provide the 21 examples of financial reports and constitute the main body of the book.

Chapters II and III include ten and four examples, respectively, of "troubled enterprises," where troubled refers to enterprises whose independent auditors have expressed uncertainty as to the probable continued existence of those enterprises in the auditor's reports. The ten examples in Chapter II consist exclusively of enterprises that are *not* in the process of reorganizing. The four examples in Chapter III are of enterprises that *are* in the process of reorganizing.

Chapter IV provides four examples of financial reports of enterprises that had been reorganized and recently discharged from proceedings under Chapter 11 of the U.S. Bankruptcy Code.

Chapter V shows financial statements of three enterprises while they were in the process of being liquidated. In Chapters II, III, and IV, excerpts of financial statements are illustrated, but in Chapter V complete statements are reproduced.

The stated purpose of this AICPA series is to provide interested readers with examples of how technical pronouncements are being applied in practice so that those confronted with similar situations may benefit from the various disclosure and reporting decisions that have been faced by others. This purpose clearly has been achieved by the authors. Uncertain financial conditions of the types illustrated in this book are relatively uncommon. Thus, this survey should save many hours of research time by both accountants and auditors confronted with similar situations in practice.

This volume could be useful in several ways, especially in teaching auditing. The auditing instructor will find that it is an excellent source of illustrations of actual "subject to" auditor opinions on financially troubled enterprises. Because all the pertinent financial disclosures associated with these opinions are included, these illustrations will provide excellent classroom examples for examining the seriousness of the financial difficulties leading to such opinions. Advanced auditing classes could use some or all of these examples as the basic documents for developing in-depth case study assignments. The survey also will be an exceptional reference document for practitioners facing these unusual circumstances.

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LAWRENCE A. GORDON and GEORGE E. PINCHES, *Improving Capital Budgeting: A Decision Support System Approach* (Reading, MA: Addison Wesley Publishing Co., 1984, pp. x, 116, $9.95 paper).

This is a well-written, useful book that takes an integrated look at the capital budgeting process and the information needed to support an effective capital budgeting system.

The primary theme is that information systems in most firms are not designed to provide effective support for capital budgeting decision making and that informational impediments (missing, wrong, unreliable, or untimely information, and information overload) act as barriers to the use of sophisticated capital budgeting techniques. The authors contend that the proper design of a Decision Support System (DSS), defined as an information system designed to support and improve the effectiveness of managerial decision making, can help improve the capital budgeting process. The book focuses on major, nonroutine, capital budgeting decisions and DSS as computer-based information systems.

The capital budgeting process is broken down into four general phases: identification, development, selection, and control. Discussion of each of these phases and associated information needs makes up the five core chapters, two of which are devoted to the selection phase. Each chapter features a table setting forth typical information needs for that phase. The same three-level classification system (*ex ante/ex post,* financial/nonfinancial, external/internal) is used to organize the table of information needs for each phase. Two introductory chapters provide an overview of capital budgeting decisions and an introduction to computer-based DSS. Two final chapters discuss development and implementation of a DSS to support effective capital budgeting decisions and the effectiveness and cost efficiency of such DSS.

The major strength of this book lies in the presentation of capital budgeting as a process which involves issues of strategy and computer-based information system design, in addition to the application of capital budgeting decision models to select projects. This reviewer agrees with the authors' premise that identification, development, and control of capital projects are critical to the overall effectiveness of the capital budgeting process.

The book does a good job of raising questions about information needs at each phase of the capital budgeting process and the requirements of a computer-based DSS to support the process. At 116 pages the book is short enough to be assigned and read in two or three class sessions and should meet the needs of its intended market, i.e., as a supplement to managerial accounting, financial management, capital budgeting, information systems, or business policy and strategic planning classes at the graduate or undergraduate levels.

This is a useful book, even though a deeper coverage of some of the subject matter (only 20 pages are devoted to the core chapters on identification, development, and control as compared to 35 pages on selection models) and more extensive and practical examples would have more fully realized the expectations the authors build up in their opening pages.

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SIDNEY J. GRAY, Editor, *International Accounting and Transnational Decisions* (London and Stoneham, MA: Butterworths, 1983, pp. xi, 500, £20.00, $59.95 paper).

The editor's stated purpose of this book is "to contribute to the development of the subject [of international accounting] by providing a collection of readings that should usefully supplement material in the few international accounting textbooks now available or serve in the development of independent courses at senior undergraduate and postgraduate level" (Preface). The readings have been published previously by authors both from the United States and other countries including Canada, Scotland, and England.

The 30 articles are divided into five broad sections that are listed below along with a brief description of each.

I. The International Dimensions of Accounting: This section has two articles: one discusses the main reason for studying international accounting while the other provides a description of the development of the managerial aspects of international accounting.
II. Comparative International Accounting: Of the four articles in this section, one describes the development of a national accounting system while the other three attempt to develop patterns of national accounting system development.
III. International Accounting Standards: The legal, economic, political, and cultural factors that influence and/or inhibit the development of international accounting standards are examined in four articles.
IV. Transnational Financial Reporting Issues: This section has ten articles, two of which examine a broad range of issues in each of five topics—accounting, segment reporting foreign currency accounting, inflation accounting, and social reporting.
V. Transnational Financial Decisions and Control: This section also has ten articles with one article each on foreign investment decisions and foreign exchange risk management and two each on capital budgeting and long-term financing, international taxation, transfer pricing, and performance evaluation and control systems.

The volume contains a brief, five-page introduction that states the book's purpose, explains the breakdown of the sections, and summarizes the role and content of each selected article. On a more specific (and perhaps picky) note, the articles are reprinted directly from the original journal pages; as a result the text has a variety of formats and type faces. Also, the citation to the original publication was omitted for one article (no. 15, but it has been located in *Accounting and Business Research*).

The articles are drawn from a wide variety of journals with a heavy concentration in *The International Journal of Accounting: Education and Research* and the *Journal of International Business Studies*. This is not surprising as these are the only two major journals which publish only articles with an international emphasis. A frequency chart for those journals with two or more representative articles follows:

Journal	*Number of Articles*
1. *International Journal of Accounting*	7
2. *Journal of International Business Studies*	4
3. THE ACCOUNTING REVIEW	3
4. *Accounting and Business Research*	3
5. *Journal of Accounting Research*	2
	19

Although several articles have multiple authorship, this is more than offset by the multiple entries of several authors, so the 30 articles have a total of only 27 authors, over one-half (18) of which were published prior to 1980. An interesting and somewhat unusual feature is that four of the selections are either authored or co-authored by the editor, but all of these had been published in major academic journals.

While the editor suggests that the volume could serve as a basis for an independent course, the lack of descriptive comments and integrating material at the beginning of each section may make this difficult. Also, the inclusion of discussion questions for the articles would have enhanced the appropriateness of this volume for both formal course and independent study purposes. The volume is better suited to be a supplement for a formal course in international accounting. Unless an instructor is planning to use a majority of the articles, he/she may be reluctant to require students to buy this book (especially in view of the U.S. price) and may prefer instead to put selected articles on reserve in the library.

This volume probably is of most use as a reference for those interested in conducting research in international accounting. The articles survey the types of research which have been undertaken on a broad range of topics and can serve as a springboard for developing future research projects.

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SIDNEY J. GRAY and ADOLF G. COENENBERG, Editors, *EEC Accounting and Harmonisation: Implementation and Impact of the Fourth Directive* (Amsterdam, New York, and Oxford: North-Holland—Elsevier Science Publishers, 1984, pp. xii, 173, $36.75).

This volume in the Advanced Series in Management contains papers presented at a conference of the European Institute for Advanced Studies in Management held February 7–8, 1983 in Brussels for the purpose of gaining "a better understanding of the different approaches to the accounting harmonization process adopted by the various countries involved" (p. v). Although member countries were required to amend national laws by December 31, 1980, only Denmark and the United Kingdom presently have incorporated Fourth Directive requirements into their legislation. Progress in other countries is delayed to make use of this opportunity to accomplish some basic reforms of their accounting systems. Nevertheless, the approaches to be used are sufficiently clear to provide understanding of existing problems and differences.

Part I of the book briefly summarizes the aims of harmonization. Part II examines the state of development in seven countries (Ireland, Luxembourg, and Greece are not included). Part III analyzes the different understanding of the "True and Fair View," and Part IV looks at future prospects.

In the case of *Belgium,* various royal decrees already have been passed, but further steps are necessary to accomplish full harmonization. In *Denmark,* the accounting law did not make use of Fourth Directive exemptions for small companies to publish abridged statements and also goes beyond minimum requirements (e.g., consolidated statements); some difficulties will be caused by the fact that the contribution approach was used for most income statements, which differs from the new regulations; it is expected that some companies will continue using this approach. In *France* the *Plan Comptable Général* has been adjusted to include the required statement formats. The requirement for notes to financial statements has resulted in the introduction of up to 28 new schedules to be appended to statements. In *Germany* the development is delayed—in spite of the fact that the Fourth Directive is relatively close to the corporation law—because of the tie-in of commercial and tax statements which prevents companies from complying with certain revaluation requirements and the treatment of deferred taxes. In *Italy* all balance sheet requirements have to be rewritten, whereas income statements cause less of a problem. In the *U.K.* compliance by and large has been accomplished. These are but a few of the points discussed.

All contributors to this volume are highly regarded scholars in their countries, and the topics are treated at an advanced technical level. Because this book deals with specific technical issues rather than generalities, which often prevail in the English language international accounting literature, it should be required reading for international accounting instructors and graduate students who are interested in EEC harmonization problems.

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LESLIE E. GRAYSON and C. J. TOMPKINS, *Management of Public Sector and Nonprofit Organizations* (Reston: Reston Publishing Co., Inc., 1984, pp. viii, 376, $23.95).

In view of the relative paucity of texts dealing with nonprofit management issues, this book is a welcome addition to the rapidly growing literature in this important field.

The authors present this book as a survey of "major concepts of management as applied to public sector and nonprofit organizations using a case study approach" (p. vii).

Given this objective, it is not surprising that the book does not attempt to cover any topic in depth. Chapter 1 provides an overview of what follows and the remaining six chapters deal with six separate areas such as systems analysis, productivity measurement, planning, management accounting, budgeting, and marketing. Since no conceptual scheme integrates the whole presentation, a reader with a special interest may venture into a selected chapter without having read prior chapters.

The message of the book is contained in 18 real-world cases spread over the seven chapters. For the most part these cases are rich descriptions of actual practices and challenges facing management in selected organizations. They are drawn from:

Government	6
Healthcare	5
Fine arts, museum	5
Public interest	1
University	1
Total	18

Only two of the cases contain explicit questions to guide analysis. In others, the central issues will have to be defined by the reader after a careful study of the case. This may be a strength or a drawback depending upon the instructor's point of view.

Each chapter begins with an introductory note that varies in length from three (on marketing) to 13 pages (on systems analysis, planning, and managerial accounting). Altogether, chapter introductions take up 63 pages, leaving the remaining 313 pages for cases.

Not made clear is the audience the book tries to serve. For the novice, the chapter introductions are too brief to be useful preludes to the analysis of cases. For the advanced student or the experienced practitioner, these brief introductions are virtually superfluous. Successful use of this book would depend upon the instructor's abilities as a case teacher and upon the use of supplementary reading materials. Perhaps the greatest use of this book may be as a source of cases in a course on general management with particular emphasis on public sector and nonprofit organizations.

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PAUL A. GRIFFIN, *Cases in Corporate Financial Reporting* (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xiii, 321, $13.95 paper).

This book consists of 62 cases organized to illustrate 12 general topics. Each case includes all or part of the financial statements of a company, a short description of the company and its major line of business, and a set of questions relating to the financial statements. In addition, a brief description of the particular issue that the case is meant to illustrate is given, along with a statement of estimated completion time.

The author provides two teaching aids within the book. The first is an Appendix giving suggested case assignments for use with the relevant chapters of three Prentice-Hall textbooks. The second is a set of check figures for student use, with at least one check figure for each case.

The book is designed for the undergraduate intermediate accounting level or for several graduate and executive levels. This reviewer used the book at the graduate intermediate and executive MBA introductory levels, and also used several cases as final examination questions.

Many of the cases in the book require quite mechanical solutions, with some being largely a matter of finding a number or a policy statement that already appears in the statements. The primary virtue of these cases is that the student is forced to search the statements, read the footnotes, and in the process, presumably become more adept at understanding financial reports.

Some of the cases require more analysis of unstructured situations and consideration of policy questions, usually as a "capstone" question after the mechanical issues have been dealt with. However, the general reaction of students was that most of the cases weren't really "cases" but problems based on real financial statements rather than concocted ones. Instructors who wish to use this book for more than that description implies probably would want to add their own questions or issues.

Several problems arose in the use of the book. The first printing had numerous errors—page numbers that didn't agree with the table of contents, check figures that were incorrect, and a few questions that simply could not be answered with the information given. Second, neither my students nor I liked the inclusion of estimated difficulty and solution time with each case. In some cases the solution times were very far from the time actually required and caused confusion. For example, one case has an estimated time of 45 minutes; good students completed it in ten minutes and assumed that they must have missed the point of the questions. Then they wasted considerable time trying to figure out where they had gone wrong, when they had, in fact, done the case properly. The time and difficulty estimates should be in the instructor's manual, not in the casebook.

This book can be a useful supplement and convenient source of a large number of pre-screened financial statements, especially for courses that seek to enhance mechanical skills. If the errors in check figures and unanswerable questions can be removed, the book should appeal to many instructors. Otherwise, one should disregard the check figures and be very careful in assigning the questions that are included with each case.

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RAMESH GUPTA, *Inflation Accounting* (New Delhi: Tata McGraw-Hill Publishing Co. Ltd., 1983, pp. xii, 288, Rs. 96.00).

This book explains the concepts and techniques of inflation accounting for preparers and users of financial statements—primarily those in India. Emphasis throughout is on the historical development of principles and on a lucid exposition of the procedures and calculations.

In the first chapter, the author traces the evolution of the concept of income and value measurement, and poses the dilemma created by price-level changes. The Edwards and Bell treatment of business income is discussed and illustrated. The second chapter contains a brief explanation of three methods of inflation accounting: current purchasing power (CPP), current cost (CCA), and the combination of specific and general price-level accounting. The strength of this chapter lies in the examples that range from very simple to quite complex and show the computations in great detail, applying all the methods to identical data sets.

The next four chapters, constituting the bulk of the book, are devoted to the institutional development of inflation accounting in the United Kingdom, and include a discussion of Exposure Drafts 8, 18, and 24, the Hyde guidelines, and the Statement of Standard Accounting Practice (SSAP) No. 16. Various methods covered in these documents are explained with the help of several examples and a number of cases and research studies on Indian companies (many of which are based on earlier publications of the author). A 77-page appendix reproduces all of SSAP 16 and the Guidance Notes.

In Chapter 7, developments in the United States are summarized. SFAS 33 is discussed briefly and compared with SSAP 16. Another chapter is used to show the current status of inflation accounting in several other countries, indicating briefly the similarities and dissimilarities among the same. Perhaps the part of greatest interest to readers of THE REVIEW would be Appendix II to Chapter 9 in which the author presents a comparative picture of the effects of monetary items and gearing (borrowings) on inflation-adjusted income figures under the requirements of various countries (U.K., Australia, New Zealand, U.S.A., and Canada), and illustrates the differences with a clear example.

One chapter is devoted exclusively to a discussion of the need for inflation accounting in India and the potential problems of implementation. It contains a limited review of the Indian literature on the subject, as well as the author's proposal for initiation. A discussion paper published by the Institute of Chartered Accountants of India in 1982 also is reproduced, in which both the CPP and CCA methods are presented for consideration of its members.

The book does not contain a rigorous analysis or evaluation of the various methods of inflation accounting. Also, keeping in view its international flavor, an obvious omission is a discussion of International Accounting Standard No. 15. But the book can be helpful in gaining a clear understanding of the techniques and procedures of inflation accounting, and in developing a brief acquaintance with the methods used in several countries. It can be used as supplementary material in accounting courses in the theory, international, and history areas, and could be a useful addition to a school of accounting library.

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H. PETER HOLZER, et. al., *International Accounting* (New York: Harper and Row Publishers, 1984, pp. xix, 524, $40.50).

The field of international or multinational enterprise accounting has made major strides during recent decades. Accounting education at colleges and universities should reflect its divergent elements and patterns. This has been recognized in the U.S. where the American Assembly of Collegiate Schools of Business now includes an international component in the curricula accreditation standards for both business school and accounting programs. Including international accounting in the educational programs has created a need for good textbooks in international (comparative) accounting. Unfortunately, few good textbooks have been on the market, and several marketed as such have consisted of a series of readings or essays that fall short of being well structured and coherent. A good textbook not only should be fairly consistent in its contents and lead the student through a series of sequential areas of thought in a carefully structured way, but also should enable the student to test his knowledge attained in the area by means of questions, problems, and/or cases. A teacher's guide and/or solutions manual should be part of a textbook package.

The book under review consists of a compilation of essays by various accounting academicians (several well known) and accordingly should be classified as a "readings book." It has four parts, but a justification and overview of these parts is not presented. Part One (40 pages) gives an introduction dealing largely with international historical aspects; Part Two (170 pages) covers technical aspects of the multinational enterprise (such as financial reporting issues, currency translation, taxation, managerial accounting and auditing); Part Three (180 pages) compares accounting principles for financial reporting in different countries and regions (essentially first world countries), while Part Four (90 pages) covers other topics, such as accounting in socialist (second world) economies and third world countries. Some of the better readings are the following:

The introductory chapter by Dean Vern Zimmerman offers an excellent and concise, mainly historical, summary of the international dimension of accounting. In Part Two, Konrad Kubin gives an elaborate presentation (60 pages) on financial reporting for international operations, and (in contrast to many other chapters) includes many good questions of a variety of types. Jane Burns also offers good, clear, and well-referenced insight into U.S. Taxation of Foreign Source Income, with several good cases. Part Three explores accounting practices in different countries or regions and some good coverage is presented by Kenneth Most in a chapter on Accounting in France and by Hanns-Martin Schoenfeld in a chapter on Accounting in the European Community. In Part Four, Maureen Berry presents a well illustrated and referenced chapter on Accounting in Socialist Countries.

Even when evaluated as a readings book, this book has deficiencies:

- The individual chapters/readings are written by different authors and lack a consistent and coherent structure, while the contents—both technical and conceptual—are uneven and vary in several respects. As a readings book it could have benefited from a good editing job to make the essays more cohesive and of approximately the same format, and to bring the various components together.
- It lacks an introductory chapter that presents an overview of the elements being covered in the book, and how these fit together; it also lacks a summary review of the readings to introduce each Part. The reader is left to plow through each chapter without having had the benefit of knowing where the parts and chapters are leading. Also, some essays require the reader to follow detailed calculations while others merely give an overall sketch of the topic being covered.
- The comparative aspects, which could have been covered in an overview chapter for each part, are deficient; our students (or readers) require a good insight into *comparative* elements instead of an enumeration of various distinct aspects of international accounting.
- An important omission is the pedagogical aspects of teaching and covering international accounting that should have been presented in a chapter on teaching or conveying international accounting issues to accountants.

This book has several positive features:

- A number of the readings are very good, and give a good presentation of the relevant issues.
- It covers a wide range of topics, which may be of interest to anyone wanting to know something about various international topics. Unlike other books or readings it is not limited to a series of selected topics.

Although it falls short as a textbook, it could be used effectively as a supplementary readings book, but the price may make this unattractive. Another alternative would be to use it as a supplement with an ample supply on reserve in the school or university library.

Good international accounting textbooks are needed and this book contains the basic material for such a text. Thus, it should be considered for a second edition that builds on the strengths of this one with editing, revision, writing, and rewriting to overcome the weaknesses.

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ANTHONY HOPWOOD and CYRIL TOMKINS, Editors, *Issues in Public Sector Accounting* (Oxford: Philip Allan Publishers, Ltd., 1984, pp. ix, 247, £18.00 cloth, £8.95 paper).

During the past decade, interest has increased in the accounting problems of the public sector of the U.K. Despite this, a number of circumstances have inhibited the emergence of a widely accepted, up-to-date text on public sector accounting until the past year or so. Thus, the main efforts of academics in this area have been directed toward research, and the deep-seated nature of the problems which they have discovered (and not yet resolved) have impeded the development of an authoritative, analytical text. This has been exacerbated by the turbulent nature of the public sector, in which changes of government have brought about dramatic changes in structure, systems of regulation, and accountability and, thus, much of what is written is quickly out of date.

This background must be considered in any text on public sector accounting. The subject of this review is one of four books recently published in this area. But the declared aim of Hopwood and Tomkins was the production of a book which is different from these other, conventional texts. Instead, they have identified key issues in public sector accounting and invited 12 others to join them in contributing papers that address these issues.

The editors appear to have adopted a style of text identical to that of a well-known series on accounting from the same publisher. But the differences are subtle. Thus, in selecting contributors, the editors have not confined themselves to academics, nor to accountants. Also, in general, these contributions are not simplified versions by the authors of work that they have published elsewhere. Furthermore, the editors have identified "political and organisational processes" (p. 9) as critical factors in the development of public sector accounting and as a theme which permeates the individual contributions comprising this text.

Given these constraints on the production of this book, the editors' aims, and the manner in which they sought to achieve them, numerous observations can be made about its quality and usefulness. The structure of the text (Part 1: External Reporting and Accountability; Part 2: Financial Planning and Control; Part 3: Value for Money and Performance Review) is logical. But it is not truly comprehensive. One major omission is an examination of the *raison d'etre* of the public sector. Without such discussion the size and structure of the public sector is taken as given, which does not accord with the experiences of this sector of the economy. Nevertheless, the individual contributions are well written (Likierman's chapter, on planning and control in central government, is particularly lucid and concise). The contributions from practitioners (particularly that of Holtham) are full of insights and will benefit students with little or no knowledge of this area.

The theme of "political and organisational processes" is best developed in the chapters contributed by the editors and by Jönsson (on budgeting in central and local government). The other chapters are predominantly discussions of technical issues (for example, Hepworth and Vass on accounting standards; Perrin on capital accounting). This is not to detract from the chapters which *do* address technical issues, as these contain much valuable material for students of public sector accounting.

Teachers of accounting might use this text in a variety of ways. It could be used in conjunction with existing public sector accounting texts, by providing additional breadth of coverage. Alternatively, it could be used selectively over a number of courses (for example, auditing, financial, or management accounting). It also might serve as the basis of a less structured, seminar-based course for students with an existing knowledge of current accounting issues. Indeed, the editors must be congratulated on the compilation of a collection of papers which will prove to be a most useful addition to the shelves of teachers of public sector accounting.

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TOM LEE, *Cash Flow Accounting* (Wokingham, Berkshire, England: Van Nostrand Reinhold Co., Ltd., 1984, pp. xii, 154, £14.00 cloth, £7.25 paper).

Lee has made a substantial contribution to the literature on cash flow accounting—23 of the items in this book's bibliography are of his authorship—and in recent years he has come to advocate a system which integrates "pure" cash flow with movements of other resources expressed in exit values (as representing "potential" cash flow). In planning this book he set out to explain his own approach and to "specify a model of reporting . . . [which] could be used as a basis for further development and discussion" (p. ix); this is exactly what he has achieved. The result is a lengthy exposition of his system's mechanics together with a description of its merits and a commentary on the interpretation of the statements it yields that is, perhaps deliberately, rather naive and tendentious in places.

Lee suggests that his book "should not be taken as . . . a rejection of conventional accounting" (p. 6), yet the reader is left in little doubt that he regards cash flow accounting to be superior. For example, he questions whether "replacement cost information corresponds with the economic reality of the entity [because entry values] obscure the factual cash flow data [and] rely on subjective allocations of equally subjective valuations" (p. 38). Friends of replacement cost would reply that, while *part* of it, cash flows do not circumscribe the real world of organizations, that what is only subjectively knowable is not necessarily unreal (depending on how one defines "reality"—Lee does not), and that in any event most corporate cash flows have only a rather dubious "real" existence as book entries. What seems to be required is a much more rigorous examination of the metaphysics of the accounting world.

For Lee, cash flow is "the 'bed-rock' that cannot be flexed" (p. 29). Clearly managers have some discretion, for example, as to the timing of receipts and payments and the segment of the organization to or from which cash flows. Lee accepts this and makes some suggestions as to how his system might be adapted to cope with these problems. The proposal that receives most prominence is the use of multi-period reporting to overcome the timing problem; examining trends is a common response to the scope for "cosmetic accounting" in conventional systems. Several problems also arise in classifying cash flows, for example (as proposed by Lee) into "operating" and "capital" flows. Many of these difficulties are dealt with very superficially in a brief chapter coming after the discussion of interpretation. This will disappoint those who look for a frank examination of the weaknesses as well as the strengths of cash flow accounting.

The author suggests that his book will be used mainly as a teaching text in advanced courses; despite this he has made it "as simple as possible" (p. x). The result is a rather unhappy compromise: too detailed for the elementary reader yet insufficiently critical for the more advanced student. The book actually may prove most useful in providing, as the author himself intends, a focus for further discussion.

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Reed H. McKnight, *Measurement Error and Banks' Reported Earnings* (Ann Arbor: UMI Research Press, 1983, pp. 116, $34.95).

This book, a revision of the author's 1981 doctoral thesis, is an ambitious attempt to explore the changing price-level issue. It focuses upon a single industry (banking), overcomes many deficiencies of earlier studies that tested the debtor-creditor hypothesis, and provides a thorough review of the debtor-creditor literature. The book is well written and addresses many interesting issues in a competent fashion. But similar to past tests of the debtor-creditor hypothesis, the methodology adopted in the study introduces numerous sources of measurement error and, perhaps as a result, definitive results are not obtained.

According to the author, banks' reported earnings contain two types of measurement error. One type relates to general price level changes, and arises because banks fail to include holding gains and losses on monetary items in their reported earnings. The other relates to specific price level changes, and exists because banks do not include in reported earnings changes in the market value of their investment portfolios. Statement No. 33 addresses only the first source of measurement error, and does not completely alleviate it. SFAS 33 is confined to the traditional accounting concept of a monetary item, and ignores certain items (e.g., future tax savings related to depreciable assets) which in substance are of a monetary nature. Also, the Statement focuses upon purchasing power gains and losses based on book rather than market values of firms' net monetary items. Finally, it ignores unrealized changes in market values of banks' investment portfolios.

The author contends that the degree of association between security prices and information systems should increase as information becomes more highly refined. To test his hypothesis, he examines ten information systems, where GAAP is the least refined system, GAAP based on SFAS 33 is the second least refined, and additional refinements come about by adjusting GAAP based on SFAS 33 for (1) inflationary gains and losses on items that in substance are monetary (e.g., future tax savings related to depreciable assets), (2) purchasing power gains and losses based on market rather than book values, and (3) unrealized gains and losses on banks' investment portfolios. Contrary to the author's expectations, he found the least refined system (GAAP) to be most highly associated with abnormal returns. While he obtained some evidence that GAAP based on SFAS 33 provided additional information regarding firm value, he obtained no evidence that more refined information systems exert any impact on firm (equity) value.

Past studies of the debtor-creditor hypothesis required actual and expected rates of inflation. This study does not require these data, but it *does* require actual and expected (1) GAAP earnings, (2) inflationary gains and losses based on the SFAS 33 definition of monetary items, (3) inflationary gains and losses on non-SFAS 33 items which in substance are monetary, (4) inflationary gains and losses using market values rather than book values, and (5) unrealized market value gains and losses on banks' investment portfolios. The GAAP earnings-generating process is well known, but little is known about how to formulate expectations of the other items. Moreover, insufficient temporal data exist to model their generating processes. Past studies of the debtor-creditor hypothesis evaluating firms' returns generally have failed to adjust for risk. This study explicitly adjusted for risk by using the two-factor (industry/market) model. Nevertheless, the author used monthly data and good news/bad news trading rules, rather than daily returns and portfolios based on both the sign and magnitude of the variable in question (e.g., GAAP earnings surprise). Thus, the author's inconclusive results may be due partly to misspecified expectations models for (1)-(5) above, use of monthly rather than daily (or weekly) data, and using the sign of the variable while discarding information on its magnitude.

In sum, this book contains a lot of information, presents it in a coherent and thought-provoking fashion, and can be read in one or two hours. Although the book is flawed in parts, it is well worth reading for those interested in valuation issues, and is essential for those interested in the debtor-creditor hypothesis.

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SHANE MORIARITY and CARL P. ALLEN, *Cost Accounting* (New York: Harper & Row, Publishers, 1984, pp. xxi, 970, $32.50).

This new textbook illustrates how computer technology should affect the future horizons of management accounting. First, Moriarity and Allen emphasize the quantitative aspects of decision making. Several chapters present complex quantitative tools which can consider simultaneously several parameters for a potential decision set. For example, both the Shapley Allocation Method and PERT incorporate several important parameters or critical time paths. These methodologies are excellent examples of how computers can facilitate more effective and efficient decision making.

Moriarity and Allen use the principles of simplification to discuss several complex quantitative tools. They begin these explanations by presenting a very simplified quantitative method. Other quantitative methods that could be substituted then are discussed in sequential order. Each subsequent method considers one more decision parameter than its predecessor. This style facilitates an excellent comparison of alternative quantitative methods. It also provides an excellent background for teaching other principles of cost-benefit analysis. Further, these presentations provide excellent examples for building computer programs to perform such accounting functions.

Moriarity and Allen integrate the separate sections of the book superbly. The first section discusses various problems involved with accumulating and using statistical data. The second section describes various types of decisions which managers frequently make. The third section outlines how the statistical data are processed into budgets while planning how to execute decisions. The fourth section focuses upon recording the results of operations. Particular attention is given to valuing inventories for manufacturing concerns. The final section demonstrates how the budgets and accounting records are compared to attain accounting control and alter future decisions. The themes of cost-volume relationships and cost-benefit continuously reinforce the effectiveness of this integration. This approach should give students insights into the principles of decision support systems.

The book's appendices provide flexibility for educational purposes without reducing the value of the organizational structure. The appendices allow a choice between emphasizing record-keeping functions or more quantitative topics. For example, the subjects of the appendices range from payroll accounting and accounting records for standard costs to linear regression, learning curves, and linear programming. These appendices begin with transitions that integrate them with the basic chapters and any preceding appendix. Thus, an effective organizational style is maintained even when the appendices are used.

Several aspects within the text, plus the supplemental materials, enhance the text's teachability and flexibility. The book includes an excellent inventory of problems for both the basic chapters and each appendix, and many of these problems require the use of the computer. The book also provides computer programs to assist students in solving these problems. The study guide that accompanies this text adds details to enhance the student's understanding if difficulties are encountered in reading the basic text. This approach allows students to vary their amount of reading depending upon their individual skill and interest. Finally, the text is supplemented by two practice sets. The first is a comprehensive problem that integrates many of the concepts included throughout the book. The second provides the opportunity for students to use the computer to solve several types of complex quantitative problems. This wide assortment of included supplemental material enhances the range of objectives for which the text can be used.

While the text is extremely well organized, Moriarity and Allen is less comprehensive than some competing textbooks. For example, minimal attention is given to subjects such as organizational behavior, management principles, and microeconomics. Also, the authors emphasize interpretation of the output from the information system. Thus, fewer details are given to illustrate how the information is processed. Although computers are mechanical devices that can effectively perform highly complex mathematical functions, students do need to understand the subjective and mechanical functions performed by the computer. Hopefully, Moriarity and Allen will modify their next edition to resolve these weaknesses. Meanwhile, instructors adopting this text should consider modifying their lectures to overcome these specific weaknesses.

Overall, this represents a step forward in cost accounting texts. Its excellent organization and flexibility should enhance the education process for cost and managerial accounting students. Thus, strong consideration should be given to adopting this new text.

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STEPHEN A. MOSCOVE and MARK G. SIMKIN, *Accounting Information Systems: Concepts and Practice for Effective Decision Making,* Second Edition (New York: John Wiley & Sons, 1984, pp. xxi, 721, $35.45).

Designed for a one-semester or quarter upper division course, this 20-chapter text provides a thorough and unique coverage of the role of accounting information systems (AIS) in the modern business environment. The text dynamically integrates computer concepts and examines organization subsystems as an integral part of chapter discussions of accounting information for management decision making, internal control techniques, and systems development. The authors also present supplemental discussions of computer topics in a four-chapter optional coverage section and in other chapters effectively examine special topics such as computer crime and systems for small business, service, and not-for-profit organizations.

In the second edition the authors have continued a flexible coverage design, added clarifying discussions and illustrations, updated conceptual subject matter, and reorganized and rewritten prior material (the first edition was not reviewed in THE REVIEW). The new edition contains more in-depth discussions of data base structures and approaches, and completely new sections which examine several levels of support systems for accounting applications. Increasing understandability and accessibility to the material, these second edition changes have improved the conceptual content and flow, the integration of chapter coverage, and the introductory-level analyses and wordiness.

Each chapter is conducive to a case or problem presentation approach and contains question, problem, and short case sections. In addition to the short cases following each chapter, five comprehensive real-world cases that can be used for individual or group project assignments are given in a separate section. Many problems and cases are adapted from past professional examinations; most are of excellent quality and are of sufficient and varied rigor. These exercises generally are incisive, pertinent to the conceptual text material, and facilitate the student learning experience. Included in the second edition are a number of new cases and problems; some less relevant exercises have been omitted, and some residual introductory-level problems can be used at the discretion and preference of the instructor. Accompanying the text is an instructor's manual that presents solutions to exercises but that unfortunately contains a few carryover errors from the first edition.

The new edition features helpful aids to the student such as a "Key Terms You Should Know" section; these terms also are highlighted each time they appear in the chapter. Large bold-type section headings are used and bold transparency masters of the many fine illustrations are included in the instructor's manual. Several short appendices sufficiently cover essential quantitative topics, and present subjects of less interest to accountants such as concise computer programming examples and comparisons. A separate test bank contains hundreds of true-false and multiple-choice questions—many are adapted from past professional examinations and are of superb quality.

Largely fulfilled are the authors' objectives of analyzing the role of AIS within a company's operating environment, and of presenting analyses that help students learn to interact effectively with computerized information systems. Setting it apart from its competitors, the text has a uniquely management accounting orientation, successfully integrates computer concepts and organizational subsystems, and continually displays exceptional practical knowledge of both accounting and computers. These qualitative characteristics should be consonant with the expectations of many instructors; thus the text merits consideration for adoption in an undergraduate AIS course.

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JAMES A. PATTEN, *Fundamentals of Bank Accounting* (Reston: Reston Publishing Co., Inc., 1983, pp. xv, 285, $18.95).

Previously, no introductory texts were available in bank accounting; this book attempts to fill that void. Readers are assumed to have completed the equivalent of a semester of accounting. Intended users and objectives are diverse: 1) academics offering entry-level courses, 2) bank employees wanting knowledge of bank accounting, and 3) bank officers wanting a guide for developing training programs or policy manuals. But the objectives are too heroic given the briefness of the text, which also causes the book sometimes to not clearly communicate key concepts.

The book is written in a familiar, first-person style, as if the author were lecturing in a class. It focuses on a blend of introductory financial accounting and internal control topics, and it is presented using a balance sheet approach. Asset and liability accounts, together with related revenue and expense accounts, are discussed. Early chapters conclude with a list of internal control questions similar to those found in audit programs; in later chapters, the reader is asked to develop similar internal control questions. Unfortunately, little explanation of the objectives of internal control is provided until later, and little effort is made to tie introductory financial coverage to internal control topics. The book concludes with overview chapters on the income statement, internal control, data processing, income taxes, and analysis of financial performance. Scant assignment material is provided for each chapter. Solutions are provided in the text.

Coverage is predominantly procedural; theoretical coverage is minimal. Consider the coverage given interest revenue. Little theoretical discussion of revenue recognition is provided, and interest computations are made at a very basic level. The standard interest computation algorithm is not stated, and the time value of money basically is ignored. Consequently, recognition of interest revenue is addressed at a simple level. For example, investment discounts (premiums) are amortized using the straight-line method; the effective interest method is never demonstrated.

Uncollectable accounts provide another example of procedural focus. The sample entry to record the estimate of uncollectable accounts debits Interest Income and credits Reserve for Possible Loan Losses. "[T]his emphasizes that uncollectable loans are a reduction of the amount of interest income earned by a bank" (p. 63). Neither the matching principle nor the possibility that the debit could be to an expense account is mentioned.

The text is sometimes difficult to follow. For example, a list of transactions and entries to record them is presented. But the order of the transactions and the order of the journal entries differ (pp. 12–13). Unnecessary and sometimes unexplained abbreviations are used. For example, "DDA-individuals" (p. 16) has obvious meaning to bankers, but may be meaningless to college students.

In summary, the text attempts to fill a void in the area of bank accounting. But given its briefness, the text tries to accomplish too much. Of the intended users, the text probably would best serve bank employees wanting a basic knowledge of bank accounting—either in a special training program or on a self-study basis. Considerable lecture and assignment supplements would be necessary for this text to serve as the backbone for a reasonably rigorous college course.

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FELIX POMERANZ, *Managing Capital Budget Projects: A Preemptive Audit Approach* (New York: John Wiley & Sons, 1984, pp. x, 258, $39.00).

Coopers & Lybrand developed and trademarked "Preemptive Auditing." This practitioner's reference manual by one of their distinguished partners describes the application of Preemptive Auditing to the management of capital budget projects. The purpose of the Preemptive Audit is to ensure that the construction project is completed on time and within budget. Preemptive Auditing can be distinguished from other types of auditing by its focus on prospective transactions instead of completed ones. In addition, all controls are subject to review without any distinction between internal accounting and operational controls.

The book is divided into three parts and five appendices, plus a bibliography. A conceptual introduction to Preemptive Auditing is provided in Part I. In addition to describing the functional characteristics of a Preemptive Audit, contrasts are made with financial audits, operational audits, program-results audits, strategic audits, and social audits. Two chapters are devoted to discussing the general and specialized techniques of the Preemptive Audit.

The design and engineering of a capital construction project is referred to as Phase I. The activities of the Preemptive Auditor in this phase are the topic of Part II. Auditor involvement includes review of procedures for planning the project, budgeting, design and implementation of a management information system, contract administration, contractor selection, and compliance with affirmative action.

The actual construction of the project is referred to as Phase II and is the topic of Part III. The auditor focuses on determining whether the procedures defined in Phase I are followed as prescribed. Specific problem areas addressed in this part include site security, safety rule enforcement, contract compliance, construction on latest approved drawings. timely evaluation and optimal resolution of claims, change-orders, material cost and quality, labor contract and affirmative action compliance, accounting and reporting, and start-up tests.

The approach used by the author in Parts II and III is to provide an audit program with checklists of specific procedures to be performed. The appendices provide additional checklists of tasks to be performed by both the auditor and the contractor.

The book is easy to read and understand. It would be a valuable addition to the reference library of auditors in industry, government, and public practice who are involved in construction projects. It also would be valuable as recommended reading for students in auditing and in managerial accounting courses that include capital budgeting as a topic.

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CRAIG E. REESE, *Deregulation and Environmental Quality: The Use of Tax Policy to Control Pollution in North America and Western Europe* (Westport, CT: Quorum Books, 1983, pp. xix, 495, $45.00).

This book is a comprehensive stand-alone treatise on the manner and extent to which Western industrialized societies have addressed water, air, and solid waste pollution issues through public sector controls. The text specifically covers the social controls of regulation, subsidization (including tax incentives), and taxation as implemented and/or proposed to control pollution in Canada, France, West Germany, Sweden, the United Kingdom, and the United States.

The objectives, research questions, scope, and limitations of the work are spelled out in the first chapter. The objectives can be summarized as follows: (1) to compare the pollution control policies of six nations, (2) to analyze the use of tax policy as an effective means of achieving policy goals, and (3) to provide a framework for further examination of the role of taxation in the optimal mix of pollution control policies in the United States. The first of these objectives certainly was achieved in that the bulk of the text, Chapters 3 through 8 (one chapter for each country), consisted of a very detailed and thorough descriptive narrative of each nation's unique pollution problems, historic development of its anti-pollution public policy, and mix of pollution control laws. Chapter 11 uses tables and narration to provide a descriptive comparison of the pollution control laws in the six nations. The author shows how each nation's domestic political system, legal traditions, cultural values, and national style shape its approach to managing environmental quality. Partially because of the voluminous descriptive detail of the book, the establishment of a normative analytical framework with which to evaluate an optimal mix of policy tools is lacking. No formal hypotheses or models are formulated or tested; the analyses are purely descriptive.

Chapter 2 provides an interesting and informative conceptual framework that integrates the technical bio-spheric and welfare economic aspects of various forms of pollution and their control. The material is presented to allow environmental scientists, economists, and policy makers to grasp each other's perspective regarding pollution control issues. The author does an excellent job of developing the notion that the capacity of the environment to assimilate pollutants safely is a public good that cannot be allocated by private markets, and that externalities resulting from the residuals of production and consumption must be controlled by the public sector to achieve a socially optimum level of environmental quality. The author stresses the importance of the need to measure the economic damages caused by given levels of pollutants rather than focusing on purely physical measures such as weight and volume of effluence. The author develops the argument that taxation is superior to regulation as a social control over pollution. In presenting evidence to support this argument, the author fails to acknowledge opposing theories such as direct regulation (e.g., see Buchanan and Stubblebine, *Economica,* November 1962, pp. 371-384).

The discussion in Chapter 9 of the tax-planning opportunities that are available to businesses that invest in pollution control assets is comprehensive and informative. Most literature that covers asset cost recovery alternatives only glances upon such opportunities. The presentation of how the cost recovery provisions of I.R.C. Sections 167, 168, and 169 interrelate with the investment tax credit, the minimum tax, and financing with industrial development bonds is excellent. An understanding of such is essential for comprehension of the impact recent tax legislation could have on the efficiency and effectiveness of waste management in our society. Another strong point of the book is the historical account (Chapter 8) of the deregulatory impact of the "New Federalism" of the Reagan Administration on environmental public policies.

The author concludes that the "polluter pays principle" is well entrenched in Western political philosophy, and the use of regulation as a means of social control has reached the point of diminishing returns. This observation combined with a lessening of public resistance towards user taxes and the current deregulatory climate, leads the author to forsee a greater shift towards taxation as an instrument of social control.

This book should be of interest to anyone interested in learning about the interface among technical, social, political, economic, and international aspects of public policy issues. The text should be an excellent resource for anyone interested in researching environmental issues in that each chapter is well referenced with many academic, governmental, and journalistic sources. Included in the appendices are the texts of various anti-pollution laws, I. R. C. regulations, EPA regulations, and the addresses of state environmental agencies. This book is a valuable contribution to the public policy literature in that it ties together in one volume many aspects of an ever-increasing social problem, the efficient management of environmental resources in industrialized democracies.

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GOKUL SINHA, *Value Added Income* (Calcutta: Book World, 1983, pp. xi, 176, Rs. 70, $12.00 paper).

Gokul Sinha is a reader in the Faculty of Business Studies at the University of Calcutta. This book, which is based on his Ph.D. dissertation at that university, is primarily a comparative study of the traditional accounting concept of income and "value added income." Value added income is treated as an economic concept related to value added taxes and national income accounting. Sinha aims to present a theoretical analysis of the differences between these concepts and to suggest improvements in practice based on the analysis.

Unfortunately, this book is written in very awkward English. The reader must often pause to puzzle out the meaning intended by the author. Sometimes it is unclear whether a grammatical or punctuation error has been made, and the reader is left unsure of the intended meaning.

In the considerable literature on accounting versus economic concepts of income little attention is given to value added notions. Sinha believes this is a gap that needs to be filled and attempts to do so. In classical economics, income is a return to factors of production in the form of wages, interest, rent, or profit. In simplified terms, value added income may be viewed as accounting profit with wages, interest, and rent added back or as total revenue less purchased physical inputs. In concept, value added income can be aggregated without double-counting and a value added tax avoids taxing a given product more than once as it proceeds through several entities in the process of production.

The first six chapters review the accounting and economic literature relating to income concepts, matching, depreciation, and capital maintenance. This review is weighted heavily with references to British literature prior to 1970. The remaining five chapters and appendices detail the differences between accounting profit and value added income calculations using Indian national income accounting procedures and a case study of Kesoram Industries & Cotton Mills, Ltd.

Sinha reaches the conclusion that there is no need to devise a separate set of records for arriving at value added income, since it can be calculated by making appropriate modifications to accounting data. He argues that value added income is superior to accounting profit as a measure of management performance and as a measure of social performance of an entity. Appraising performance, of course, depends on whose interests are at issue. Accounting income surely will be more relevant than value added income to the residual equity holders. Also, Sinha does not discuss a fundamental limitation on using *any* historical records to appraise performance. We cannot judge the appropriateness of actions taken without some knowledge of what would have resulted from alternative actions. Accounting never provides this information.

Because of language difficulties and a focus on local (Indian) circumstances, this work is not likely to be much used in the United States. However, it could be a worthwhile starting point for someone undertaking a study of the accounting aspects of value added tax proposals.

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WILLIAM E. THOMAS, Editor, *Readings in Cost Accounting, Budgeting, and Control,* Sixth Edition (Cincinnati: South-Western Publishing Co., 1983, pp. vi, 472, $16.00).

In its sixth edition, Thomas' book is an old friend to many users. While over 50 percent of the book's 41 articles are new, the theme of the book remains clearly focused on management control. The book is divided into seven parts, each beginning with a brief overview written by Thomas.

Part I, Systems for Business Control, is the foundation for the rest of the book. Its five articles address the management control function, reflecting Thomas' belief that cost accounting and budgeting control must be viewed in the larger context of control systems. Part II, Goals and Subgoals, contains seven articles ranging from the classic "Behavioral Assumptions of Management Accounting" by Ed Caplan to two previously unpublished papers on applying motivational theory and operational goals. The eight articles selected for Part III, Decisions, are intended to illustrate the accountant's need to understand the decision process, the assumptions underlying sophisticated decision models, and the effect situational changes have on the validity of those assumptions.

Part IV, Feedforward, contains five articles dealing with the use of budgets and other planning tools to analyze the potential impact of uncertainty on the organization. Part V, Feedback for Control, contains six articles dealing with behavioral considerations and key items managers should consider in evaluating operations. Part VI extends the theme of the book with seven articles focusing on the Control of Decentralized Operations. Included is an article on international transfer pricing, an important topic that was recommended for inclusion by the reviewer of the Sixth Edition (April 1979, pp. 479–480). Part VII, Definitions of the Control Functions, contains three short pieces dealing with terminology.

The book's major strengths are its organization and the use of papers published in sources not normally monitored by accounting educators. The book's "big-picture" approach is an appealing framework within which to present specific cost accounting or management accounting topics. But a number of articles could have been omitted bcause the topics addressed are covered adequately in cost accounting textbooks or because the topics are of little concern to most accounting educators. Candidates for exclusion include articles dealing with zero-base budgeting, capital budgeting, inventory models, and human resource accounting. A number of thought-provoking articles also could have been included. "The Costs and Benefits of Cost Allocation" by Jerold Zimmerman is a significant omission. This article would make an excellent addition to Part V. Although the book cannot be criticized for omitting an article published after it came out, this reviewer intends to include "The Evolution of Management Accounting" by Robert Kaplan in graduate cost and management accounting course assignments. Finally, the book would be enhanced for first-time users if it contained discussion questions at the end of each article or part.

This is a useful supplement to a cost accounting or management accounting textbook in an upper-division undergraduate or an introductory graduate course. This reviewer has used previous editions of this book in such courses and likely will use this or subsequent editions in such courses in the future.

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TONY TINKER, Editor, *Social Accounting for Corporations: Private Enterprise versus the Public Interest* (New York: Markus Wiener Publishing Inc., 1984, pp. 208, $19.00).

Three papers presented at a symposium organized by the Public Interest Section of the American Accounting Association in connection with the 1982 San Diego AAA convention are reproduced in this book along with participant questions and answers and a paper by the editor.

Charles E. Lindblom's paper on the accountability of private enterprise challenges the accounting profession to develop and apply social measurement schemes to the private sector that would allow the inclusion of social cost data in enterprise reports. Lindblom argues that societal control over corporations, exercised through simple marketplace selections—with its emphasis on producing at the cheapest "cost" when that cost fails to include the social effects of such things as plant location or production technologies—is insufficient. Lindblom argues that government must increase its regulatory oversight of corporate decision making and that better disclosure is needed to ensure better regulation. He urges the accounting profession to develop better disclosure models and to change its orientation from identification with the private sector's interests to alignment with a larger "public interest."

In his paper, Abraham J. Briloff takes auditors to task for either failing to report what they know or failure to ask whether certain practices are fair notwithstanding the fact that some precedent can be found in NAARS. Briloff laments the fact that both the AICPA through the Auditing Standards Board, and the courts through the Hochfelder, Redington, and Aaron decisions, have shifted the responsibility for the fairness of accounting reports away from the auditor and towards management. Briloff suggests that the FASB and the SEC are providing little benefit to anyone at present and that the conceptual framework project simply is not needed. He argues that what is needed is not more concepts and standards but more application of those that already exist.

In the third paper, Stanley Sporkin strongly urges auditors to question the fairness and reasonableness of their clients' statements in view of the clients' general business environment and not use "general acceptance" of an accounting rule as a license. Sporkin acknowledges the problem of "auditor shopping," and proposes that a system of reparations be established to compensate the auditor who is discharged for carrying out his responsibilities within the audit in a manner unacceptable to the client.

In the last section of the book, the editor, Tony Tinker, presents a paper entitled "Accounting for Unequal Exchange: Wealth Accumulation Versus Wealth Appropriation." Tinker provides a conceptual framework for accounting reports and a society's interests. Tinker outlines his perception of the capitalistic system of wealth production and use and how accounting, as it is currently practiced, perpetuates the system of alienation of one group to the benefit of another.

Readers of this book, probably without exception, will find themselves strongly disagreeing with some parts and just as strongly agreeing with others. The purpose of the symposium and the book was to create a dialogue and stimulate thinking, and to this end the book is successful.

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The Trueblood Professors' Seminar: Accounting and Auditing Case Studies, Two Volumes: "Discussion Leader's Guide," pp. vii, 190; "Student Case Book," pp. vii, 91 (Sarasota: The Touche Ross Foundation and The American Accounting Association, 1983, $6.00 each to AAA members, $9.00 to others, paper).

These two volumes present one collection of cases from the Trueblood Professors' Seminar program that provide useful materials which can be used to present students of accounting and auditing with some of the complex and subtle problems experienced by practitioners. The "Student Case Book" and "Discussion Leader's Guide" both include 24 one-page cases and four two-page cases. Sixteen focus on accounting issues, nine focus on auditing issues, and three focus on both accounting and auditing issues.

The "Student Case Book" includes the cases and study guides for most of the cases. Each study guide describes the objectives of a case, applicable professional pronouncements, business assumptions and other data, and provides a discussion which places the issues in historical perspective. The "Discussion Leader's Guide" includes the cases, the study guide information, and the "solution" for each case.

This reviewer attended the Trueblood Professors' Seminar on two occasions and has used many of the cases in accounting and auditing courses with MBA students and in executive programs. The cases can be used with minimal preparation (e.g., they can be read in class), and can be used conveniently at the beginning or end of a class to extend the discussion of various topics. The following four cases have been very useful and effective: "Off-Balance-Sheet Financing" (Case 4), "Interim Accounting—Deferral of Costs" (Case 12), "Accounting for Hindsight" (Case 15), and "Prior Period Adjustments" (Case 23). The cases also can be used as the basis for essay or discussion-type examination questions.

The case collections were distributed to about 850 professors in August-September 1983. To learn about the use of these cases, the Touche Ross Foundation undertook an informal survey in 1984 and released the results in October 1984. Of the 240 professors who responded to the survey, 52 percent indicated that they had used the cases in some fashion. Several respondents reported that the cases had been received too late to be included in their courses in 1983–84, but they planned to use some of the cases in future courses. The three most frequently used cases in undergraduate courses were "Off-Balance-Sheet Financing" (Case 4), "Contingencies" (Case 16), and "Uncertainties—Accounting and/or Reporting" (Case 13). In graduate level courses, "Off-Balance-Sheet Financing" (Case 4) and "Uncertainties—Accounting and/or Reporting" (Case 13) again were reported as the most frequently used, followed by "Prior Period Adjustments" (Case 23).

Not all of the cases from the Trueblood Professors' Seminar are included. Others that have been used successfully but not included in these collections are "Boomerang LIFO" and "Thriving, Going, or Gone?" Some of those included are not likely to be useful for a given accounting or auditing course. Each case focuses on specific topics and issues and a professor will want to select carefully those to be used. Professors also may find that they do not accept the "solution" described as the correct or right solution, but differences of opinion provide the impetus for exciting class discussions.

Publication of these case collections provides all accounting professors and their students with access to a set of unique materials. I encourage you to review and experiment with these cases.

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MURRAY C. WELLS, *Current Cost Accounting and the Nationalised Industries: An Analysis and a Proposal* (Glasgow: University of Glasgow, School of Financial Studies, 1984, pp. 72, £4.00 paper).

This Research Monograph has much wider implications than its rather specialist title implies. Nationalized Industries are a peculiarly British institution, and it is the applicability of the British version of CCA (SSAP 16) which is examined. But as Wells is concerned with "utilities," not "commercial" industries, his analysis is relevant in most public sector and not-for-profit organizations. And his criticisms of CCA generally are so damning as to cause disquiet.

Wells is critical both of the lack of theoretical justification for CCA and of its application to nationalized industries, particularly in calculating rates of return which he says has become "mathematically meaningless." Although his criticisms generally are well supported by argument, quotations, and numerical illustrations, he sometimes goes too far. He claims, for example, that with many assets (e.g., railways) the deprival value would be zero and so the rate of return would be infinite. But where the rate of return is positive, SSAP 16 seems to require the recoverable amount to be the amount generated from its further use, which would be positive.

The importance of Wells's criticisms is that as nationalized industries are expected to achieve a particular financial result, if incorrect assumptions are made about maintaining and replacing assets, unreasonable prices may be charged and the current generation of consumers may be financing facilities for future generations.

Wells's own solution involves four main criteria: stewardship, cost of service, financial viability, and responsibility reporting. He concludes that no single indicator, such as rate of return, meets his four criteria, and proposes a suite of four interlocking statements: 1) Operating statements reporting on budgets for each part of the organization. The extent of disaggregation in published statements is left open. 2) A Statement of External Transactions that would be cash-flow-based and designed to discharge stewardship. 3) A Statement of Investment showing sources of funds financing the basic infrastructure of the industry, but without current valuations. 4) A Statement of Solvency listing amounts owed by the industry, and the means of discharging these amounts, with assets shown at current cash equivalent.

Wells claims that his proposals allow users to evaluate the performance of managers in accordance with their own projections. He provides simplified illustrations of his four proposed statements, but more work is required to make them operational. He does not mention the political problems involved in persuading accountants, industries, and governments to accept radically different bases of accounting. Even among the specialist academics whose assistance is acknowledged in his work, none expressed unreserved support for his conclusions. Thus, his monograph is essentially academic, strong on criticism of the application of CCA and the use of rate of return in nationalized industries, and stimulating and original in its proposed alternatives. It should be read by civil servants responsible for evaluating the performance of nationalized industries, but even if they agree with his arguments, implementation cannot realistically be expected in the forseeable future. If his positive recommendations are not adopted, this monograph could be just another nail in the CCA coffin. If future products of Glasgow's James Cusator Wards Visiting Professorships are as challenging as this, they should not be missed.

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F. M. WILKES, *Capital Budgeting Techniques*, Second Edition (New York: John Wiley & Sons, 1983, pp. xii, 409, $34.95).

This is the second edition of a text that presents a comprehensive treatment of capital budgeting and project selection models (the first edition, published in 1977, was not reviewed). The capital budgeting material found in the widely used cost and managerial accounting textbooks is contained in Chapter 1 of Wilkes' work. The remaining nine chapters expand the discussion to include refinements of, and variations on, the universally taught IRR and NPV models, and all add introductions to alternative decision models for capital investment. Also included in this book are chapters on linear and non-linear programming techniques useful in capital rationing issues of project selection decisions. It is a thorough examination of quantitative topics only lightly examined in most managerial accounting textbooks.

Wilkes' narrative style is very precise but not necessarily easy to read. He introduces and develops the capital budgeting models and their underlying concepts with real-world examples and numerical exhibits, but switches from words to mathematical symbols so quickly and so often that the book reads more like a technical research paper than a text intended for university students.

In this second edition the author claims to have "eliminated certain gratuitous technicalities, compressed the network and transportation chapters and pruned the range of financial planning models" (p. vii). Wilkes has reduced the amount of space spent on network and distribution models (e.g., CPM and PERT) from approximately 72 pages to about 40 pages and reduced the number of specific financial planning models from five to two. The author also eliminated sections from several chapters which were technical notes on topics contained therein. He deleted or incorporated sections titled "Technical difficulties and simplifications" as well. While these and other revisions were made in an apparent attempt to make the book more readable, this work remains highly technical and requires a mathematically sophisticated reader.

Although the author's preface indicates that this is a textbook, the accounting profession should view it as a technical reference book for teachers of capital investment decision models and operations researchers. As a textbook, it is best suited for an advanced course in engineering economics since the mathematical sophistication needed is beyond the level required of most business students. The treatment of capital budgeting is thorough and comprehensive, but is too detailed for practical usage in an accounting course other than as a supplement or as a library reserve or reference book. The instructor who chooses to use this as a text should be prepared to develop his/her own study questions and problem assignments, as none are included.

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Harry I. Wolk, Jere R. Francis, and Michael G. Tearney, *Accounting Theory: A Conceptual and Institutional Approach* (Boston: Kent Publishing Co., 1984, pp. xiv, 609, $31.95).

A well-written text that focuses on the relationship of accounting theory and accounting policy-making, and which develops the subject matter historically, would be useful to advanced undergraduate or graduate students having had a course in intermediate financial accounting. This text generally fulfills such a need. It includes not only a good discussion of the development of accounting theory and regulation from 1930 to the present (the most recent reference is to SFAS No. 69), but also reasonably good summaries of the arguments for allowing an unregulated market for accounting information as well as presenting arguments for regulation based upon the public good and free rider problem. Both the summaries of the historical development of accounting theories from the ARS's to ASOBAT, APB Statement No. 4, the Trueblood Report and others are weaved in with brief summaries of capital market research, information economics, and theories of regulation that enhance the reader's interest. One might have wished for more detail on the theory, statistical methodology, and results of the summarized empirical research, perhaps similar to the Lev and Beaver books, but the audience of readers is not the same. However, because the references and bibliography are good and extensive, the students easily could explore these issues in more detail.

The first part of the book has an interesting chapter on uniformity and disclosure where the authors present a framework for examining uniformity, comparing "finite" and "rigid" uniformity and their relationships to objectives, reliability, relevance, the audit function, and other characteristics. Also included is a brief discussion of income smoothing, but it is not so, as the authors claim, that "a large body of research confirms the existence of income smoothing" (p. 318). There is as yet neither a satisfactory time series model of smoothing nor an acceptance of the variable to be smoothed.

A separate chapter is devoted to the balance sheet, profit and loss statement, and statement of changes in financial position bringing in definitions from the Accounting Terminology Bulletins, APB, and recent Concepts Statements of the FASB to illustrate changes occurring over time. (The discussion could be improved by incorporating illustrative data from the AICPA's *Accounting Trends and Techniques.*)

The second half of the book is devoted to selected, controversial topics that are related to the issues discussed earlier. These are: inflation accounting (including a brief discussion of the empirical research and approaches in several other countries), interperiod allocation of income taxes, oil and gas accounting (including brief, narrative summaries of the empirical research), pensions, leases, equity accounting, translation of foreign operations, and business combinations. All of them are dealt with historically and fairly summarized. The authors do not shrink from expressing their point of view, e.g., they are opposed to recognizing a liability for unvested accumulated pension benefits, although their brief arguments are supported only by "it may be possible" assertions.

There are many different views as to what single issues are both important and controversial, yet this reviewer would have liked to see a chapter on segment reporting (SFAS No. 14) which the Advisory Committee on Corporate Disclosure to the SEC has called a most enduring and controversial problem. Perhaps a reason for excluding it is that SFAS No. 14 is incorrectly referred to in several places as "supplemental disclosure," although SFAS No. 33, which is "supplemental disclosure," is discussed in the chapter on inflation accounting.

A few chapters contain appendices describing the details of several issues raised in the chapters, e.g., ARS 1 and ARS 3, current value depreciation, and illustrations of actuarial funding methods. Each chapter has questions, cases, and problems. A cursory examination of these led to the conclusion that they were not at the same level of quality as the book, which could be supplemented better by one of several good case books on financial reporting. But the bibliography is quite extensive and thorough.

On the whole, the book does a good job of stimulating reader interest in accounting theory by skillfully placing the issues in their historical context and development and by illuminating them with summaries of research studies that convey the difficulties of finally determining accounting rules. This approach leads to a deeper and more satisfactory understanding of corporate financial reporting.

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Stephen A. Zeff, Compiler and Editor, *The Accounting Postulates and Principles Controversy of the 1960s* (New York: Garland Publishing, Inc., 1982, pp. xxii, 480, $75.00).

This book brings together key documents on significant events in the history of what is now called standard setting. The AICPA's new "research program" was launched in 1959. Its goal was to base pronouncements on accounting principles on something more than existing practice and the views and experience of the members of the Committee on Accounting Procedure and their associates. The newly created Accounting Principles Board and the Accounting Research Division would use a greatly expanded research effort first to delineate basic postulates and broad principles of accounting and then to develop rules or other guides, based on the postulates and principles, for applying principles in specific situations.

Professor Zeff provides a short introduction, which sets the stage for the reprinted documents comprising the book, and briefly indicates what is included and why. He also provides brief explanations—"Notes on the TIMS [The Institute of Management Sciences] Initiative of 1962" and "Chambers and Moonitz on Accounting Research Studies 1 and 3"—for two sets of previously unpublished papers, which constitute almost a quarter of the book. His careful scholarship shows not only in his words of introduction and explanation but also in the appropriateness to the subject of the items included and in the completeness of the collection.

The book's title refers to events surrounding and stemming from the first fruits of the research program—publication by the AICPA of Accounting Research Studies No. 1, *The Basic Postulates of Accounting,* by Maurice Moonitz (September 1961), and No. 3, *A Tentative Set of Broad Accounting Principles for Business Enterprises,* by Robert T. Sprouse and Maurice Moonitz (May 1962). Controversy arose early, to which the APB itself contributed. Nine of the 12 members of the combined project advisory committees on the two studies had appended comments to ARS No. 3, only one of which was laudatory. The APB took the extraordinary step of holding a meeting on the study before it was published and issued a one-page *Statement by the Accounting Principles Board* that was inserted into each copy of ARS No. 3. It said, among other things:

> The board believes . . . that while these studies are a valuable contribution to accounting thinking, they are too radically different from present generally accepted accounting principles for acceptance at this time.

Reprints of the two studies and the APB Statement constitute the first third of the volume.

The other items in the collection generally are in chronological order and divide into three categories that facilitate description: papers providing background, comments on and criticisms of the two research studies or the AICPA's research program (or both), and responses by Sprouse and Moonitz.

Background papers of two kinds are included. One group has eight items from the AICPA, published 1953-1962, that described the new "research program," urged broad participation in it, or encouraged discussion of and constructive comments on the research studies. Included are speeches or articles by AICPA Presidents Alvin R. Jennings and John W. Queenan, APB Chairman Weldon Powell, and APB member Arthur M. Cannon; a report of a blue-ribbon committee; and three editorials from the *Journal of Accountancy*. Jennings' speech proposing the new program and the "Report to Council of the Special Committee on Research Programs" are essential reading for anyone who wishes to understand the program and why it was undertaken.

The second group of background papers has four articles by Professors Raymond J. Chambers (2), Richard Mattessich, and Moonitz. The first two articles, "Detail for a Blueprint" and "Towards a General and Axiomatic Foundation of Accountancy," both published in 1957, were included because "Moonitz . . . found [them] to be influential in the development of his 'postulates' approach" (Zeff's Introduction). Since the latter, by Mattessich, was originally published in *Accounting Research*, a British journal that ceased publication over 25 years ago, this book makes available a significant article that may be new to many readers. Inclusion of the other two, "Why Do We Need 'Postulates' and 'Principles'?" and "Why Bother with Postulates?", both published in 1963, needs no explanation.

Comments on and criticisms of the research studies or the AICPA's reasearch program (or both) include 11 critiques in two previously unpublished sources, "An Analysis of 'The Basic Postulates of Accounting'" (anonymous papers by eight participants) and "Transcript of the Meeting of the College on Measurements in Management, The Institute of Management Sciences [TIMS] (University of Michigan, Ann Arbor, September 11, 1962)" ("the TIMS Initiative of 1962").

The papers are a rather odd, uneven lot. Some are worth reading for the ideas and analyses they present, whatever their merits as critiques of ARS No. 1. Others probably would not merit publication by themselves but have been published because they are part of the set. The "Initiative" does not include the invitations or instructions, if any, to those who provided critiques, but the results suggest that the effort was largely misdirected. At least, Moonitz generally was justified in complaining, among other things, that many of the papers were not really critiques of his work: "[T]he first rule of valid criticism is to judge the work in the light of the intentions and the objectives of the fellow who writes it. Beyond that you haven't got criticism, you haven't got 'review' in the ordinary sense, you've got an attempt to set up a competing theory" (Transcript . . .," p. 15).

As the preceding suggests, Moonitz had the opportunity at the meeting to rebut his critics and had received the eight anonymous papers in advance. (Zeff's "Notes . . ." describe the detective work involved in identifying the eight anonymous "participants," but I won't give away the secret.) As I read the papers and the transcript, the image that sprang into my mind was that of young Daniel alone in the lions' den. But Moonitz not only directed general criticisms of the kind already noted at his critics, he also singled out three of the papers for some penetrating observations. Some of the lions, not Daniel, got bloodied.

Previously published comments on and criticisms of the research studies or the AICPA's research program (or both) include comments of members of the project advisory committees (already noted), summaries of comment letters received on the studies (published in the *Journal of Accountancy*, January and April 1963), and papers and reviews by Herbert Heaton, A. C. Littleton, Eric L. Kohler, William J. Vatter, and Raymond J. Chambers, published 1962-1964.

Those comments and criticisms run the gamut, from a few expressing praise or challenging methods and specific conclusions but expressing generally favorable reactions, through a majority more or less echoing the "too radically different" theme of the Board's Statement or generally defending the *status quo*, to a substantial number expressing rejection or anxiety and alarm, if not a touch of panic.

A brief description cannot do justice to those comments and criticisms and cannot even suggest the richness and variety of the sources reprinted in the book. They must be read to be appreciated, and this book brings together the bulk of the most thoughtful (and also of the most thoughtless—or to use Chambers's description, "visionless") evaluations of the studies.

Responses by Sprouse and Moonitz form the smallest part of the book (about 40 pages). Moonitz not only responded orally to the TIMS Initiative but also responded to Chambers's paper in correspondence. Moonitz's rejoinder to Chambers's critique, Chambers's reply to the rejoinder, and a brief commentary by Mattessich on Chambers's critique are being published for the first time.

Sprouse's speech, "The 'Radically Different' Principles of Accounting Research Study No. 3," not only defended proposals that admittedly involved significant changes (e.g., use of replacement costs and accounting for general-price-level changes) but also poked gentle fun at some of the critics. He began by chiding those who had been surprised that the studies recommended some significant changes. After all, general dissatisfaction with the state of existing practice had been the reason for the new research program. He also noted that numerous practices that had been vehemently attacked as "radical departures" in fact were generally accepted accounting principles. Thus, even in trying "to support and rationalize prevailing practices, apparently we [Sprouse and Moonitz] managed to sound as though we were proposing radical departures" (p. 66).

The book closes with Moonitz's "The Breach of the Covenant," a brief description published in 1974 of the events in April 1962 preceding publication of ARS No. 3 with the APB's Statement inserted; the title is explained by these excerpts from its first two paragraphs.

> By this action the board swept away the strong implication in the report of the Special Committee on Research Programs that research studies be given wide circulation and exposure *before* the board acted on them. . . .
>
> Perhaps the APB was correct in its assessment that the research studies were premature. But the APB was not correct in aborting the results of the research effort. The studies should have been left to circulate for a time, such as a year, to see if they floated or sank (pp. 18–19).

Despite the clamor, much of the two accounting research studies has been incorporated into authoritative pronouncements, as Zeff notes (Introduction). Their ideas appear not only in numerous APB Opinions and FASB Statements, but also most explicitly in APB Statement No. 4 and FASB concepts Statements. That stems partly from the fact that many of the things complained about were in fact accepted when the studies were published.

But the most controversial aspects of ARS No. 3—such as replacement costs for inventories and plant and equipment, which many commentators saw as threats to what they often called the historical cost system—remain controversial and evoke pretty much the same kinds of responses as they did more then 20 years ago. Much of that is reflex reaction, stemming from a natural and understandable resistance to change. Sometimes, however, responses are raised to a highly emotional level by charges that someone intends to bring about imminent and sweeping change in current practice. For example, the anxiety and alarm noted in criticisms of ARS No. 3 also appear in letters, comments, speeches, and articles about FASB's concepts Statements as a sort of conspiracy view of standard setting—fear that an irresponsible standard-setting body, or at least its malevolent staff, intends to foist radical changes in practice, such as "current value accounting," on a largely unsuspecting constituency that needs to be warned in time. The more things change. . . .

This book brought back memories. One of my first assignments after joining the staff of the AICPA's accounting research division was to analyze the comment letters received on ARS No. 3 and prepare one of the items reprinted in this volume. Although not a direct participant until later (in what eventually became APB Statement No. 4), I was a fascinated observer of the "accounting postulates and principles controversy of the 1960s," as well as a close associate of Maurice Moonitz before, during, and after the period the book describes.

Since I have continued to work on efforts to develop postulates and principles, now called a conceptual framework, I have closely followed later developments. For example, I have seen some progress in developing basic concepts of financial accounting and reporting. While I was working on the summary of comments on ARS No. 3, the late Perry Mason asked me if I had read all of the letters. When I assured him that I had, he replied, "Doesn't make you very proud of the profession, does it?" That might have been the epitaph of the accounting profession's efforts on "postulates and principles" were it not that we seem to have learned something about the process. Despite the conspiracy view of standard setting and the responses it evokes, the FASB fortunately receives a larger proportion of responses that include constructive comments and criticism than did the APB on Accounting Research Studies No. 1 and 3 over 20 years ago.

This book constitutes an excellent case history. Every student of financial accounting and reporting, whether still in the university or not, should be familiar with the events with which it is concerned. But those who are today's students and tomorrow's leaders and teachers especially need to study it. Since its price makes it unlikely that professors can put it on book lists for students to buy, libraries should have an adequate supply, and it should be included liberally on reading lists.

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STEPHEN A. ZEFF, Editor, *Accounting Principles through the Years: The Views of Professional and Academic Leaders 1938–*

1954 (New York: Garland Publishing Co., 1982, pp. xvi, 409, $60.00).

This book is a collection of speeches and papers presented at annual meetings of the AICPA (formerly AIA) during the period 1938–1954.

Nearly 20 years ago Carman Blough, the first Chief Accountant of the SEC, observed that "the first concerted, serious action toward the development of accounting principles took place in the early 1930's." He went on to note that during the first six months of 1935 after the newly formed SEC became operational, "probably more questions on accounting matters were raised and resolved, rightly or wrongly, than ever before or since in a like period of time." ("Development of Accounting Principles in the United States," *Berkeley Symposium on the Foundations of Financial Accounting,*" Berkeley: University of California, Berkeley, 1967, pp. 2, 4.)

If the early 1930s was a period of action in the development of accounting principles, the period covered by this collection is clearly one of reflection, discussion, and debate over those principles —and this volume contains the views of the major participants in that discussion and debate. Many readers will recognize the names of most if not all of them—big names such as George O. May (4 papers), William A. Paton (3 papers), Eric L. Kohler (1 paper), Carman G. Blough (2 papers), Walter A. Staub (1 paper), William W. Werntz (4 papers), Stephen Gilman (1 paper), and Maurice E. Peloubet (4 papers).

Many of the topics covered seem to be timeless and might well be found on the agenda of an AICPA meeting today, such as that of a 1948 panel discussion of "Business Costs and Business Income Under Changing Price Levels" and several papers on the age-old FIFO-LIFO controversy. But others are unique to their time and provide interesting insights into how much at least some aspects of financial reporting have changed. For example, in a 1943 article entitled "Questions of Presentation of Financial Statements Having Their Origin in War Conditions," Percival F. Brundage notes that "Many companies have made substantial reserves for war and postwar contingencies but very few have indicated specifically the purposes for which the reserves have been provided" (pp. 47–48). Even though he notes that those reserves were for such vague purposes as possible "inventory losses, postwar rehabilitation, or reconversion of plant, deferred maintenance, and contingencies" (p. 48), and they were sometimes based on "pure conjecture," Brundage speaks approvingly of them and advises his audience that "some latitude should be allowed to management in this respect and if the auditor feels satisfied that the provisions are reasonable under all the circumstances a separation and detailed explanation need not be required" (p. 48). Another comment, this one by Phillip L. West, then Acting Director of Stock List of the New York Stock Exchange (and later Vice President), also seems unique to its time. He observes in a 1944 speech that "[i]t would seem to me that the financial statements could be prepared in such a manner and in such form that they would stand on their own feet without the necessity of qualifying footnotes" (p. 166). Imagine a stock exchange official making that comment today!

Clearly the topic that dominates this collection is the controversy over what should be included in the income statement, or what is often called the all-inclusive vs. normal operating concept of income. Five of the six 1944 papers are from a panel discussion of this under the heading "Historical vs. Earning Power Concept of the Income Statement," and it crops up again and again throughout the entire volume. One gets the impression that it was considered *the* most important issue in financial reporting during this period.

All except one of the papers were published previously by the AICPA as part of the proceedings of its annual meetings. The justification for reprinting them in this volume, according to the unsigned preface (apparently by Zeff), is: "Few libraries, one supposes, hold copies of most of the [annual meeting] volumes, let alone the entire series. Yet they contain numerous papers on controversial topics of the day, and most were written by leading academics, professionals, and government officials" (p. vi).

The papers included are clearly of great historical interest and should be more generally available to students and researchers, but the publisher should have done a better job on the physical production of the book. Some of the pages are so poorly reproduced that they are difficult to read, and they are not numbered seriatim. That omission seems particularly ironic in a book published for the purpose of making previously published papers more conveniently available. It makes use of the book inconvenient and it makes citation by researchers (and book reviewers!) difficult, if not impossible.

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CAPSULE COMMENTARIES

Harvey S. Hendrickson, Editor

The Commentaries in this issue are by the person indicated.

BILL ADLER with BILL ADLER, JR., *The Wit and Wisdom of Wall Street* (Homewood: Dow Jones-Irwin, 1984, pp. vii, 93, $9.95 paper).

This refreshing little paperback is a collection of some 400 aphorisms about business, government, politics, money, and life by well-known as well as obscure professional and nonprofessional persons. It would be useful for avocational reading and as an anecdotal reference for speeches and other presentations.

H.S.H.

ALVIN A. ARENS and JAMES K. LOEBBECKE, *Auditing: An Integrated Approach,* Third Edition (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xvi, 793, $31.95).

The third edition of this text improves on the strong earlier editions (the second edition was reviewed April 1981, pp. 412–413). The continued integration of conceptual and practical material provides students with a rich picture of the audit process, and much of the material formerly presented in a "checklist" format is described more completely. The format incorporating flexible modules is continued.

Significant changes include:

- The chapter on audit reports is moved to the beginning of the text to Chapter 2 from Chapter 21, providing students with knowledge of reporting early in the term.
- A new Chapter 8 on Materiality and Risk has been added which reflects changes promulgated in SAS's 39 and 47. Coverage of this topic is a needed addition to any auditing text. Arens & Loebbecke present applications of risk and materiality concepts clearly. But a stronger discussion of the links between these two critical concepts would be helpful to students.
- The chapters covering the early stages of the auditor's opinion formulation process have been rearranged and streamlined. The planning phase of the audit is presented more lucidly than previously.

The book's production values are superior; the typefaces are clear, and the authors guide the reader with marginal diagrams and notes. The problem materials now provide a separate section of CPA multiple choice questions pertinent to each chapter.

In summary, while the text has some limitations, the third edition is an excellent text which merits adoption.

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HERBERT ARKIN, *Handbook of Sampling for Auditing and Accounting,* Third Edition (New York: McGraw-Hill Book Co., 1984, pp. xv, 526, $49.95).

The third edition of this popular handbook continues along the lines of its previous editions with no major departures. The primary change from the second edition (published in 1974) is the inclusion of a few new topics such as sampling with unequal size clusters, ratio estimates of a ratio, and post-stratification methods. Consistent with earlier editions, the book is designed as a working reference for practicing accountants.

The book provides a broad range of statistical sampling techniques that are useful in the field of accounting and auditing. The text is procedural rather than conceptual—basic concepts are presented and then followed with an explanation of the related methodology. While underlying formulas are cited and/or explained, in most cases an abundance of tables makes the solution of formulas by the reader unnecessary (only 238 pages are text; the remaining pages consist of tables and appendices).

The earlier chapters cover the fundamental principles of statistical sampling. Because the author assumes that the reader has little, if any, knowledge of statistical sampling, the book presents detailed descriptions of even the most basic concepts. For example, several pages are devoted to the mechanics of using a random number table. Following the basics are good applications-oriented chapters on traditional topics such as discovery sampling, acceptance sampling, stratified sampling, cluster sampling, and difference and ratio estimates. The new topics are limited to relatively brief, but good, coverage in a final chapter. A topic that should have been included in this new edition was probability proportionate to size.

As in prior editions, Arkin continues his criticism of the one-sided approach recommended by the AICPA for compliance testing. While the book was published three years after the issuance of *SAS 39,* recommendations and requirements presented in that release are completely ignored.

The major weakness of this book is that it is not as current as its 1984 copyright suggests. Although it has no bibliography, a review of the footnotes indicated only two post-1974 references and one of these was to the author's own 1982 publication, *Sampling Methods for the Auditor, An Advanced Treatment* (reviewed January 1983, pp. 170–171).

Despite its weaknesses, the author accomplishes his stated purpose of providing practical guidance for both financial and governmental auditors. His practical approach to statistical sampling, which includes some useful shortcuts, no doubt will continue to serve as a useful, although somewhat out-of-date, reference to the many practitioners who have advocated his previous edition. The book was not intended for academic use and can not be reccommended for the classroom due to its cost and lack of currency. But several reasons can be advanced for adding it to the School of Accounting library—not the least of which being its once preeminence.

RITA P. HULL
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Virginia Commonwealth University

JONATHAN J. DAVIES, *CPA Liability: A Manual for Practitioners* (New York: John Wiley and Sons, 1983, pp. x, 212, $45.00).

This book provides public accountants with a working understanding of the legal environment in which they practice. It emphasizes points of law that affect an accountant's liability to clients and third parties, particularly in issues associated with an audit practice. It provides many coherent discussions of the legal issues of contract, tort, or statutory law.

The book's principal weakness stems from Davies' assumption that the reader fully understands his/her professional responsibilities—which accountants frequently come to interpret by the way the courts have viewed the actions of their colleagues. But the book frequently fails to describe the accountant's behavior that the courts found deficient or negligent.

The book is divided into four sections. The first provides an introduction to the growing scope of an accountant's legal liability, causes of this increasing exposure, and the effects of this threat of litigation on the accounting profession.

The second section investigates an accountant's liability under common law. It begins with a lengthy discussion of an accountant's liability under contract law and tort law, and provides the legal framework for subsequent discussion. But it does little to distinguish between the most important and less important issues in subsequent case law. Common law, supported by the findings of particular cases involving accountants, then is discussed in the context of the audit function. The discussion of auditors' liability to clients under contract law is excellent. The discussion of auditors' liability under tort law provides a very good development of issues surrounding auditors' liability to third parties. It is easy to follow a progression of legal decisions from the time when auditors had little liability to third parties, to the current environment where auditors are liable to foreseen classes of third parties for negligent behavior. But this section suffers from inadequate treatment of auditor behavior that the courts considered negligent.

The third section focuses on state and federal statutes that affect the auditor's statutory obligations associated with the sale and trading of securities. The development of these statutes is presented in an introductory chapter, followed by chapters on an auditor's specific civil and criminal liability. This section provides a good discussion of burden of proof and auditor defenses under statutory law. The discussions of CPA behavior that led to the findings in the auditor's or plaintiff's favor provide more details than were present in the discussion of common law, but they remain very cryptic.

The final section deals with accountants' liability for the performance of non-audit services, principally liability associated with tax and MAS practices. These chapters are the weakest in the book.

The chapter addressing tax practices covers the unauthorized practice of law, a tax practitioner's civil liability, and IRS access to workpapers. The discussion of unauthorized practice of law is very general, and makes no mention that state laws may affect this issue. The section on IRS access to workpapers is not current and makes no mention of developments associated with the *U.S. vs. Arthur Young* case that have been developing over several years.

The chapter on MAS practice and other nonaudit services is based largely on theories of legal liability because little case law deals directly with this area of practice. This chapter is particularly weak as it gives very light treatment to compilation engagements where some case law exists, and it virtually ignores review engagements. The lack of adequate discussion of an accountant's liability associated with compiled financial statements is a significant shortcoming for the many practitioners who are not members of SEC Practice Section firms.

This book is presented as a practitioner manual. As such it should be recommended primarily for the practitioner in an accounting firm that is a member of the SEC Practice Section. While it contains lessons to be learned by all CPAs, this book is not adequately oriented to the sole practitioner or member of a small CPA practice. As for classroom use, it is best suited for a law class. The lack of adequate discussion of accountant behavior that led to legal liability detracts from the book's potential usefulness for accounting courses at either the undergraduate or graduate level.

RAYMOND N. JOHNSON
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CHARLES T. HORNGREN, *Introduction to Financial Accounting,* Second Edition (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xviii, 798, $29.95).

The second edition of this book, like the first (reviewed April 1982, pp. 445–446), compares favorably with the very best of its competitors. As a primary text for undergraduate or graduate entry-level financial accounting courses, this book has no serious weaknesses. It does, on the other hand, have important strengths which deserve to be emphasized.

The first of these is clarity of presentation. Learning objectives are specified clearly at the beginning of each chapter, and later are reinforced with excellent summary material and solved review problems. Difficult concepts are illustrated with well-framed numerical examples, and discussions throughout the text are simple and direct, with minimum use of extraneous accounting jargon.

Second, the text is easily adaptable to different course structures and teaching styles. For example, following general textbook practice, Horngren positions such topics as inflation accounting and the statement of changes in financial position in "last place." But each is presented at a very simple level in the main body of the chapter, with appendices reserved for greater detail. Thus, these important topics may be dealt with conveniently either early in the course, in the more traditional sequence, or both.

Finally, the author has managed more skillfully than most to narrow the gap between classroom elementary accounting and events in the world at large. Concepts are illustrated, both in the text and in abundant assignment material, by reference to excerpts from published financial statements. Techniques of financial statement analysis are introduced gradually and topically throughout the text, rather than being postponed and treated collectively in an arid final chapter. This sharper than normal focus on the usefulness of financial statements helps to capture the attention and interest of students.

Supplemental materials, including working papers, a student guide, practice set, test bank, solutions manual, and transparencies, are available and adequate.

Apart from a significant and useful expansion of assignment material, differences between the two editions consist of relatively minor changes in the sequencing of topics, the addition of new end-of-chapter summary sections (Highlights to Remember and Accounting Vocabulary), the addition to Chapter 15 of a discussion of the cash basis statement of changes in financial position, and the deletion from Chapter 8 of material which illustrates certain aspects of systems design and internal control.

ROBERT B. THOMPSON
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University of Texas at Austin

JEROME KRAUS, *How U.S. Firms Measure Productivity* (New York: National Association of Accountants, 1984, pp. x, 100, $8.95 paper).

The purpose of the Kraus study was to investigate how large U.S. corporations measure or intend to measure productivity and how they use that information. A two-page questionnaire was designed and used to gather data regarding the firms' productivity measures and was mailed to 403 companies. The companies either had real assets greater than $125 million before deducting depreciation or total assets greater than $1 billion after deducting depreciation (the minimum size for SFAS No. 33 disclosures). The questionnaire was answered by personnel at 120 firms and returned unanswered by personnel from 16 firms. The initial mailing generated 88 responses. A follow-up mailing and phone calls generated the remaining 48 responses. The report gives no indication that Kraus tested for differences between the first and the later responses.

The responses are summarized in approximately 65 pages of tables. Kraus' analysis and description of the study are probably less useful than the tables. His description and analysis tend to be informal and not very precise (e.g., he uses terms such as "often," "very," "several" to describe the study and analyze the study results). For some SIC categories cross-comparisons were attempted, for instance, for SIC 48 (Communication) and SIC 49 (Electric, Gas, and Sanitary Services). In doing the cross-comparisons Kraus provides insight into the different approaches to productivity measurement that exist across SIC categories. But such analysis was done for less than one-third of the SIC categories surveyed.

The Kraus conclusions combine results based upon the study, normative statements, and in at least one case an over-generalization based upon the results of the study. That is, Kraus found that 48.3 percent of the 120 firms did not indicate output:input or input:output ratios as their most important measures. He concluded from this that "half the largest companies in the United States do not have a firm commitment to productivity measurement in the sense of relating inputs and outputs" (p. 55). This statement is an overgeneralization and an example of Kraus' imprecise style.

The monograph is useful in that it presents self-reported data of 120 firms on the productivity measures that are considered most important, are being considered for use, and have been rejected. This makes it a handy reference to answer questions about how firms measure productivity and how they use the measures.

K. J. Euske
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Naval Postgraduate School

Kenneth Lacey, *Profit Measurement and Price Changes* (New York: Garland Publishing, Inc., 1982, pp. xviii, 129, $20.00).

This monograph was first published in London in 1952 (reviewed January 1954, pp. 164–165). It presents a well-written, *a priori* case for coping with the problem of tax rates on "Business Profits" and long periods of continually rising prices (that was referred to as an unprecedented period of 12 years when the book was written but that now extends to nearly 50 years). His solution is the adoption of a concept of income (for financial reporting as well as for taxes) that would maintain intact "the same volume of physical assets" (p. ix). His proposed reforms are an outgrowth of his study of trade cycles and Keynesian solutions; he concludes that the "deception" or "money illusion" of inventory gains and losses will magnify the multiplier effect and intensify "booms and slumps." It is an attempt to combine accounting, economics, and public finance to solve the perceived problem.

His presentation is well reasoned in the areas that he considers, but he seems to ignore that expected cash flows (not reported income) are the inputs for capital budgeting models, and that required adoption of his proposal would tend to have a smoothing effect on the incomes of business firms which could interfere with governmental countercyclical fiscal policies (advocated by Keynes).

This volume would be of most interest to students of income and inflation accounting.

H.S.H.

Chauncey Lee, *The American Accomptant* (New York: Garland Publishing, Inc., 1982, pp. xi, 308, $30.00).

This is a reprint of a textbook published in 1797. It is claimed to be the first book on arithmetic published by an American author. It includes sections on bookkeeping for businesses and farmers, simple and compound interest, foreign exchange, weights and measures, and sample forms for a variety of transactions as well as lessons in arithmetic (and an errata page). This delightful little book would be of interest primarily to students of accounting history. It is reminiscent of, and may well be Reverend Lee's counterpart to, Edward Hatton's *The Merchant's Magazine* . . . (Capsule Commentary, April 1985, p. 345).

H.S.H.

Richard D. Lehmbeck, *Successful Cash Management in Your Business* (New York: John Wiley & Sons, 1984, pp. xiii, 236, $24.95).

This book is designed to assist businesses in managing cash. Written by a partner in Main Hurdman/KMG, the book provides an excellent brief reference for managers in a number of financial areas in addition to cash management. The topics cover a wide range of business concerns including record-keeping and office automation. While the book indicates that it is designed for small business owners and corporate managers, the detail provided on a number of topics better serves those in smaller businesses. For example, lock box accounts are discussed in over one-half a page.

The author indicates that the book was written in a "flexible and open-ended manner so that it can be tailored to the specifics of any business" (p. vii). While the author is successful at this, references are not provided for those having an interest in pursuing a particular topic.

This book should be useful as a reference for managers of smaller businesses or as a work that a consultant or professor might recommend to such a manager looking for guidance on how to do it himself.

James H. Scheiner
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University of Tennessee

George Hillis Newlove, *Consolidated Balance Sheets* (New York: Garland Publishing, Inc., 1982, pp. x, 309, $30.00).

This is a reprint of a textbook published in 1926 (reviewed June 1927, pp. 195–196). Like the 1922 book by Finney (Capsule Commentary, January 1985, p. 160), this is considered to be a classic on the topic that continues to be a major part of advanced accounting courses. Although Newlove presents some procedural steps that he calls rules and some family trees that portray some very complex interrelationships, both books also are alike in presenting primarily technique and illustration with essentially no explicit conceptual material. Although long associated with the University of Texas, Professor Newlove was Associate Professor of Accounting at Johns Hopkins University when the book was published.

H.S.H.

Arnold J. Olenick and Philip R. Olenick, *Making the Non-profit Organization Work: A Financial, Legal, and Tax Guide for Administrators* (Englewood Cliffs: Institute for Business Planning, Inc., 1983, pp. xviii, 395, $89.50 looseleaf).

This is a looseleaf, how-to-do it manual for administrators and staff in nonprofit organizations. It is well-organized, concise, indexed, and provides easily understood step-by-step instructions to help officers, directors, and staff as well as outsiders who provide accounting and legal services. It emphasizes the accounting aspects of accountability and was designed to help not-for-profit organizations develop good accounting records that should help them to manage the monetary resources that they have, to justify their case for additional funding from government and private sources, and to justify the continuation of their tax-exempt status.

Academic and practicing accountants who are or have recently become involved with public interest accounting and/or not-for-profit organizations would find this book useful for background reading and reference purposes; it also would be useful as a work to recommend to junior staff and to new and less-well-managed organizations for the orientation and guidance of staff and administrators.

H.S.H.

Donald E. Ricketts and Horton L. Sorkin, *Quantitative Techniques for Internal Auditing,* Research Report Number 27 (Altamonte Springs: The Institute of Internal Auditors, Inc., 1983, pp. x, 106, $33.00 paper).

This study identifies quantitative techniques other than statistical sampling that will aid internal auditors in the performance of their duties. The techniques mentioned are ratio analysis, trend analysis, failure prediction techniques, regression analysis, reliability theory, simulation, network models (PERT and CPM), GANTT scheduling, linear programming, and goal programming. Four chapters contain brief descriptions of these techniques, examples of actual applications, and results of a survey of members of the Institute of Internal Auditors. An appendix discusses the techniques together with pertinent literature citations.

A comprehensive bibliography is probably the study's most useful feature for academicians. The references are arranged by three audit areas of applicability (analytic review, internal control and evaluation, and audit scheduling), with 84 of the 106 references dealing with analytic review. About 40 percent of the total references come from either *The Journal of Accounting Research* or The Accounting Review, and about 60 percent date from 1976.

A survey (with an 11 percent response rate) of IIA members reports that ratio and trend analysis are the quantitative techniques most frequently used. Very little use is made of what might be considered the more "advanced" quantitative techniques. Respondents cite a lack of trained personnel as a major factor for non-use, and expect that external auditors will provide the major impetus to increased use.

Practicing internal auditors will probably find the six cases that illustrate the actual use of various quantitative techniques to be the most informative part of the study. But little guidance is provided either on developing the application or on obtaining assistance. This study would be useful as a reference in a library of an internal audit department or of a university, but is likely to be of limited interest to individuals for their personal libraries.

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T. B. Robson, *Consolidated and Other Group Accounts* (New York: Garland Publishing, Inc., 1982, pp. vi, 152, $20.00).

This is a reprint of a book published as a second edition in London in 1950. The revision incorporates the requirements of the British Companies Act of 1948 and was written to help solve the major problems encountered in preparing consolidated statements for submission to stockholders of the holding company. It presents a view of the basic principles and an indication of the procedures.

Like the earlier works by another Price Waterhouse Partner, Sir Gilbert Garnsey, in the U.K. (Capsule Commentary, January 1985, p. 160) and by Finney and Newlove in the U.S., this would be of interest primarily to accounting historians and those who specialize in consolidated reporting.

H.S.H.

L. E. Rockley, *Finance for the Non-Accountant*, Fourth Edition (London and Brookfield, VT: Business Books and Gower Publishing Co., 1984, pp. 373, £15.95 cloth; £7.50, $13.95 paper).

This book seeks to help non-financial specialists, and to some extent students, in the appraisal of financial statements and the making of effective business decisions using information derived from those statements. The fourth edition has been completely revised from earlier editions, both to take full account of recent British legislation and to update the descriptions and analyses of British accounting standards. In these latter objectives, the book succeeds. It is written clearly and cogently and its presentations are commendably thoughtful.

But the book suffers from two disabling shortcomings. First, it fails to identify clearly its target audience. The conflict, that remains unresolved here, is between the needs of the relatively unsophisticated, non-financially trained businessman and those of the business studies and management degree student.

Second, the coverage of the book's 16 chapters is disconcerting, especially when all are grouped under the blanket label of "finance." The book has three parts: financial analysis, cost analysis, and investment analysis. Of those, only the first could be said to be comprehensive. The second part confines itself largely to a discussion of breakeven analysis and a summary treatment of absorption and marginal costing. Part 3 contains chapters on capital expenditure evaluation, the cost of capital, the analysis of project returns, and risk and uncertainty.

On balance, the book has only passing attractions for degree and professional students, and it has a peculiarly British flavor, limiting its usefulness for non-U.K. businessmen and practitioners. But against that, it does have merit to the extent that it introduces readers to several fundamental and important concepts, and may serve to heighten interest so that more challenging and comprehensive treatments are sought out. Here, though, the recommended reading cited at the end of each chapter generally is less than adequate; that for inflation accounting, for instance, mentions just three references to chapters in more general books and three to 1973 and 1976 articles in accountancy journals.

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C. Rufus Rorem, *Accounting Method* (New York: Garland Publishing, Inc., 1982, pp. xvii, 596, $60.00).

This is a reprint of a one-year introductory accounting textbook that was published in 1928 by The University of Chicago Press. An interesting note is that it was reviewed (December 1928, pp. 411-413) by W. A. Paton, who was the coauthor of another introductory text (with R. A. Stevenson).

This book presents a high-level, comprehensive, modern view of accounting in 40 chapters. Mr. Rorem defined accounting as "a tool for use in the control of economic activity" (p. 3) and saw it and statistics as special applications of the same general quantitative method that had two basic processes:

(1) measurement of phenomena and (2) interpretation of data. Thus, he emphasized valuation and analysis (Part III, containing 12 chapters, is called "Accounting Valuation").

Although the emphasis is on financial accounting, the book has a brief but solid overview chapter on "Administrative Uses of Cost Data" that cites J. M. Clark's *Economics of Overhead Costs* several times and extends the different values for different purposes concept that he discusses elsewhere to include different costs. He also has a brief chapter on "Social Control through Accounts" that introduces fund accounting. The inclusion of "method" in the title probably was unfortunate since the connotations are not descriptive of the contents.

This book helps to put current accounting into perspective and thus should be of interest to all accountants, especially those having philosophical and/or historical interests.

H.S.H.

HORACE B. SAMUEL, *Shareholders' Money* (New York: Garland Publishing, Inc., pp. xviii, 392, $40.00).

This is a reprint of a book published in London in 1933. The author, a barrister and financial consultant, presents a well-documented, critical evaluation of British company law and the view that the need for reform extends beyond company accounts questions where most of the impetus was focused. Other areas of concern are loopholes in the requirements and responsibility for the prospectuses, the duties and liabilities of directors, and protection of debenture holders. He divides the book into four parts: obtaining the money, managing the money, securing the money, and accounting for the money. He closes with a series of appendices, one of which presents a draft of a bill that would close the loopholes and solve the problems that he discusses in the text.

This book would be of interest primarily to accounting historians.

H.S.H.

ALLEN H. SEED, III (Arthur D. Little, Inc.), *The Funds Statement: Structure and Use* (Morristown: Financial Executives Research Foundation, 1984, pp. x, 220, $12.00 paper).

What is the purpose of the funds statement? What should the statement contain? How can the funds statement better communicate? This monograph presents the results of a research study conducted for the Financial Executives Research Foundation to partially answer these questions. The expressed purpose of the study is "to gather facts, opinions, and examples about the structure and external and internal uses of the funds statement" (p. 4). Thus the study does not debate the issues raised, offer recommendations, or advocate a point of view.

The study included questionnaires, interviews, and a review of annual reports. Opinions and ideas were solicited from financial executives, analysts, investors, and commercial bankers. After an excellent synopsis of the research results, a detailed presentation of the views held by the various groups studied is provided. Effective use of specific examples throughout the study makes the presentation more meaningful.

The study found significant agreement on fundamental points. In particular, the funds statement is important and widely used, should be generally required, and should contain key information. Examples include a distinction between operating and nonoperating funds flows, regular and irregular funds flows from operations, types of indebtedness, and significant transactions not requiring the use of cash. Disagreements focused primarily on the most useful forms of presentation. As the viewpoints were presented in detail, the questions "Why do they believe that?" and "Have they considered this option?" kept recurring to the reviewer.

The chapters on foreign currency translation and special cases (banking, insurance, and utilities) were particularly informative because they focus on issues and questions not typically considered when the funds statement is discussed in the classroom. The final chapters, one on the user's perspective and one on internal uses, are helpful in developing an insight into existing views about the funds statement.

The study achieves the stated objective of providing facts and opinions about the uses of the funds statement. Thus it is a valuable starting point for the student or researcher who plans to examine the funds statement and consider possible changes in present practice. The monograph was not intended for classroom use and does not lend itself to use in the undergraduate course, but could be used in a graduate course that focuses a good portion of the term on the funds statement. The study does represent a valuable addition to our information on the funds statement.

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H. W. SINGER, *Standardized Accountancy in Germany* (New York: Garland Publishing, Inc., 1982, pp. xi, 83, $18.00).

This little volume is a reprint of a book published in England in 1943. It reports on how Nazi Germany imposed a standardized cost system and used it to manage/control not only firms and industries but the entire economy before and during World War II. It includes two articles and the original book review, all of which were written by Adolph Matz and that appeared in THE REVIEW (June and September 1940, pp. 177–185 and 371–379; and July 1944, pp. 339–340).

This book should be of interest to students of cost and managerial accounting and cost accounting standards.

H.S.H.

ALLEN SWEENY and ROBERT RACHLIN, Editors, *Handbook of International Financial Management* (New York: McGraw-Hill Book Co., 1984, pp. xiv, 462, $49.95).

This comprehensive reference guide is divided into 19 chapters that were written primarily for practicing professionals. The 21 authors are or have been active in international finance; they include executive officers and operating, financing, investing, and/or tax planning managers in multinational industrial, financial, consulting, banking, and accounting firms. Six of the authors are CPAs and 15 have master's degrees, 11 of which are MBAs.

Although this volume has a hands-on, procedural, technical, practitioner emphasis, its coverage of topics such as forecasting, risk analysis, accounting, and auditing and budgeting for international operations makes it a useful reference for professors and students of international accounting and finance.

H.S.H.

KENNETH R. WHITE and JAMES A. XANDER, *Survey of Internal Auditing: Trends and Practices* (Altamonte Springs: The Institute of Internal Auditors, Inc., 1984, pp. xvii, 149, $33.00 paper).

This paperback presents analyses and explanations of trends in internal auditing. It sets forth the results of the IIA's 1983 survey of trends and practices in the profession of internal auditing along with interpretations of the results. This was the fifth in a series of surveys and, where appropriate, the 1983 results are compared with those of the 1979 and 1975 surveys.

In general, the questions in the survey instrument were designed to determine conditions and changes in (1) the scope of internal audit activities, (2) organizational relationships, (3) methods of internal auditing and the reporting of results, (4) behavioral patterns of those involved with internal audits, (5) problems of and future plans for internal audit departments, and (6) EDP audits by internal audit departments.

The book, which includes hundreds of statistical tables, achieves its purpose very well. A number of groups will find the material most interesting and useful. Internal auditors and organizations which employ them will discover that the information provides excellent bases for comparisons and internal evaluations. Public accounting firms and managers of industrial companies that do not have internal auditors can better assess the dimensions of internal auditing for planning and evaluative purposes. Academicians interested in studying the current trends and practices in internal auditing also can derive considerable insight from this study.

In summary, the authors and the IIA did a fine job. While the book is composed primarily of statistical tables, the interpretations presented in the narrative are almost always on target. The material is useful and interesting for anyone concerned with conditions and trends in internal auditing.

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Loyola University-New Orleans

BASIL S. YAMEY, *Further Essays on the History of Accounting* (New York: Garland Publishing, Inc., 1982, pp. ix, 178, $30.00).

This little volume is a collection of 12 papers and four addenda pieces on the history of accounting that were written between 1977 and 1981, most of which had been published elsewhere. Many of these are extremely interesting; of particular note to this reviewer was the extended exploration of some skeletons in the closet of accounting—the allegations of plagiarism not only against the authors of the first and two later English books on accounting but also against Pacioli. Yamey reports that "Fabio Besta . . . the leading and influential proponent of the charge of plagiarism" (p. 209) claimed that both Pacioli and Oldcastle (reputed author of the first accounting book in English) had drawn heavily on an early Venetian manuscript without attribution, and in one place claimed that Oldcastle's text was merely a translation.

This must be considered a companion to the earlier Yamey, Edey, and Thomson book (reported on next in this section) that introduces the suggestion of plagiarism and much more.

H.S.H.

B. S. YAMEY, H. C. EDEY, and HUGH W. THOMSON, *Accounting in England and Scotland: 1543–1800* (New York: Garland Publishing, Inc., 1982, pp. xvi, 228, $25.00).

This is a reprint of a book published in London in 1963 (reviewed January 1965, pp. 293–294). In this volume in a combination of excerpts from books, a survey of books, an integration of previously published articles, and an extensive bibliography, the authors present a summary of accounting history and practice during the unexciting period that began with the publication of the first book in English on double-entry bookkeeping and that ended about the time that Great Britain became a leader rather than a follower in the development of accounting. It provides interesting reading and materials for accounting historians and other students of accounting.

H.S.H.

BOOKS RECEIVED OCTOBER 21, 1984 TO JANUARY 20, 1985

ADNAN M. ABDEEN and DALE N. SHOOK, *The Saudi Financial System: In the Context of Western and Islamic Finance* (New York: John Wiley & Sons, 1984, pp. vii, 287, $34.95).

Accounting Softwhere (Minneapolis: Moore Data Management Services, 1984, pp. ix, 344, $29.95 paper).

BILL ADLER with BILL ADLER, JR., *The Wit and Wisdom of Wall Street* (Homewood: Dow Jones-Irwin, 1984, pp. vii, 93, $9.95 paper).

ARTHUR ANDERSEN & CO., *The First Fifty Years 1913–1963* (New York: Garland Publishing, Inc., 1984, pp. xx, 201, $20.00).

ROBERT N. ANTHONY, *Essentials of Accounting* (Reading, MA: Addison-Wesley Publishing Co., 1984, pp. ix, 97, $129.95 software).

ROBERT N. ANTHONY, GLENN A. WELSCH, and JAMES S. REECE, *Fundamentals of Management Accounting*, Fourth Edition (Homewood: Richard D. Irwin, Inc., 1985, pp. xvi, 793, $31.95).

ROBERT H. ASHTON, Editor, *The Evolution of Behavioral Accounting Research: An Overview* (New York: Garland Publishing, Inc., 1984, pp. x, 121, $20.00).

ROBERT H. ASHTON, Editor, *Some Early Contributions to the Study of Audit Judgment* (New York: Garland Publishing, Inc., 1984, pp. x, 163, $20.00).

JOHN ARGENTI, *Predicting Corporate Failure* (London: The Institute of Chartered Accountants in England and Wales, 1984, pp. 16, £1.25 paper).

Audit Strategy and Reliance on Internal Control: An Audit Technique Study (Toronto: The Canadian Institute of Chartered Accountants, 1984, pp. viii, 51, Can. $10.00 paper).

WILLIAM H. BEAVER and WAYNE R. LANDSMAN, *Incremental Information Content of Statement 33 Disclosures* (Stamford: Financial Accounting Standards Board, 1983, pp. ix, 108, $25.00 paper).

THOMAS H. BEECHY, *Canadian Advanced Financial Accounting* (Toronto: Holt, Rinehart and Winston of Canada, Ltd., 1985, pp. xii, 614, Can. $40.95).

AHMED BELKAOUI, *Theorie Comptable*, Second Edition (Sillery, Quebec: Presses de l'Universite du Quebec, 1984, pp. 416, Can. $35.00).

ALAN A. BLOCK and FRANK R. SCARPITTI, *Poisoning for Profit: The Mafia and Toxic Waste in America* (New York: William Morrow and Co., Inc., 1985, pp. 361, $17.95).

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SYMPOSIUM ON MANAGEMENT COMPENSATION AND THE MANAGERIAL LABOR MARKET

in honor of
WILLIAM H. MECKLING

Sponsored by Managerial Economics Research Center and Journal of Accounting & Economics,
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Acknowledgments

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JULY 1985 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The REVIEW *is published on the first day of January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 33583. All replies to box numbers should be on separate sheets to facilitate forwarding. There is no charge for this service to AAA members and associate members seeking employment. Others will be charged a fee of $100 per insertion. Ads should not exceed 100 words.*

#301 POSITION WANTED: B.S., M.B.A. (The City University of New York), Ph.D. (New York University), with over 20 years experience in practicing accounting and Tax Law. Some teaching experience in Financial Accounting and Tax Accounting. Seek full-time, tenure-track position teaching Financial, Managerial or Tax Accounting. Prefer locations Southeast, South, or West coast. Write to: Apt. 1, 399 Armstrong Ave., Jersey City, N.J. 07305.

#302 UNIVERSITY OF BALTIMORE invites applications for tenure-track positions in accounting. Teaching excellence is stressed; research experience and professional activities required. Applicant must possess the doctorate or equivalent (Ph.D., DBA, LLM/CPA). The University of Baltimore is an upper division, AACSB-accredited institution at the Junior, Senior, and Master levels (Masters of Taxation and Masters of Accounting). Forward your resumé to Dr. Charles L. Martin, Jr., CPA, Accounting Department, University of Baltimore, 1401 North Charles Street, Baltimore, Maryland 21201. The University of Baltimore is an Equal Opportunity, Affirmative Action Employer.

#303 THE UNIVERSITY OF CALIFORNIA AT LOS ANGELES. Applications are invited for positions in accounting at both the junior and senior levels for appointments beginning on July 1, 1986. A Ph.D. degree is required and the candidate must exhibit outstanding research capability. Resumés should be sent to Professor Bruce L. Miller, Graduate School of Management, University of California, Los Angeles, CA 90024. Telephone (213) 825-1814. UCLA is an Affirmative Action, Equal Opportunity Employer.

#304 THE ST. PETERSBURG CAMPUS OF THE UNIVERSITY OF SOUTH FLORIDA is seeking applications for a faculty position at the Assistant rank or Associate rank in Managerial Accounting, Auditing, and Information Systems. Preference will be given to persons holding the Ph.D. or DBA degree or expecting completion by September 1986. The University of South Florida is an Affirmative Action/Equal Opportunity Employer. Please send vita to Robert J. West, Chairperson, Department of Accounting/Law, College of Business Administration, University of South Florida, Tampa, Florida 33620.

#305 ACCOUNTING: TENURE-TRACK POSITION: rank—Associate; beginning Fall 1985. Requirements: Ph.D. or DBA in Accounting with CPA. Area: Managerial or Financial. Send resumé to Dr. John Fulmer, Head, Department of Accounting and Finance, University of Tennessee at Chattanooga, Chattanooga, Tennessee 37403. The University of Tennessee at Chattanooga is an Equal Opportunity, Affirmative Action Employer and invites applications from all qualified individuals.

#306 POSITION WANTED: DBA in Accountancy (late dissertation stage); MBA; CPA. Seeking position with college or university which stresses and backs up quality teaching and research. Teaching areas: Auditing and Financial Accounting.

#307 UNIVERSITY OF SOUTHERN MAINE has tenure-track position in Accounting Department to teach Intermediate and Advanced Accounting with secondary interest in Auditing. Nine-hour course load with summer teaching available. Ph.D. or DBA (or near completion) required; CPA/CMA, college teaching experience and professional experience preferred. Candidates should possess strong teaching interest and ability. (MBA with CPA/CMA may be considered for one-year appointment.) Apply to: Professor Robert W. Findlay, Chair, Search Committee, School of Business, Economics and Management, University of Southern Maine, 96 Falmouth Street, Portland, Maine 04103. Equal Employment Opportunity/Affirmative Action Employer.

#308 FACULTE DES SCIENCES DE L'ADMINISTRATION (F.S.A.), UNIVERSITE LAVAL. La F.S.A. de l'Université Laval invite les personnes intéressées a enseigner aux programmes de doctorat, de la maîtrise et du baccalauréat at à réaliser des recherches dans des domaines reliés au Management, au Marketing, aux Systèmes d'information, à l'Economie appliquée à la gestion et aux Systèmes de décision et/ou à la gestion des opérations, à soumettre leur candidature. Ces personnes doivent détenir un doctorat ou être sur le point de l'obtenir. Les conditions de l'emploi sont régies par la convention collective en viguer. Nous offrons des postes aux rangs d'adjoint, d'agrégé ou de titulaire. Les dates d'entrée en vigueur sont à partir du 1er juin 1985. S'il-vous-plaît, faire parvenir votre curriculum vitae à: Monsieur Jean-Marc Martel, Vice-doyen académique, Faculté des sciences de l'administration, Bureau 111, Université Laval, Québec G1K 7P4.

#309 SOUTHERN METHODIST UNIVERSITY has an opening for an Assistant Professor of Accounting. Position begins Fall semester 1985. Earned doctorate or ABD. Research and teaching emphasized for tenure and promotion. Salary negotiable based upon experience and prior research record. Direct inquiries (including vita) to: Chairperson, Department of Accounting, Edwin L. Cox School of Business, Southern Methodist University, Dallas, Texas 75275. Southern Methodist University is an Equal Opportunity/Affirmative Action/Title IX Employer.

#310 POSITION WANTED: Income tax specialist, BBSc, MBA (Case Western Reserve University), CPA, former IRS appeals officer (21 years), ex criminal investigator (8 years), assistant professor (6 years) at Cleveland State University, past lecturer (18 years) CWRU School of Management, seeks full-time (not necessarily tenured) or visiting teaching appointment near Southeast coast of U.S. Write or call collect: Edward Alpern, 5596 Mayfield Road, Cleveland, Ohio 44124; (216) 442-3027.

#311 RUTGERS—THE STATE UNIVERSITY OF NEW JERSEY Faculty of Business Studies. Tenure-track faculty position—Fall 1985. Assistant/Associate Professor position expected to be available in accounting. Ph.D., and, for associate professor, strong publication record is essential. ABD considered for instructor level. Research orientation essential. Teach MBA and U.G. courses in metropolitan Philadelphia area close to beaches and mountains. Salary and rank are dependent on qualifications. Send resumé to Dr. Peter Weissenberg, Associate Dean of Faculty of Business Studies, Rutgers University, Camden, New Jersey 08102.

#312 THE UNIVERSITY OF MISSOURI—COLUMBIA, School of Accountancy, College of Business and Public Administration, has immediate openings for tenure-track and visiting Assistant, Associate and Full Professors of Accountancy. The University is an Equal Opportunity, Affirmative Action Employer. Applications from minority members and women are encouraged for these positions. A Ph.D. or near completion is required. An interest in a mix of research, quality teaching, and service is preferred. Please send vita to: Dr. Thomas P. Howard, Chair, Accountancy Recruiting Committee, University of Missouri-Columbia, 230 Middlebush Hall, Columbia, Missouri 65211.

#313 OREGON STATE UNIVERSITY has two openings for faculty positions as Assistant Professor in Accounting which will become available during the 1985–86 academic year. Responsibilities of the persons holding these positions include teaching, research, and professional activities in the field of Accounting. The teaching assignment will include instruction of accounting courses, mostly at the undergraduate level. Research activities are expected to result in the advancement of knowledge of accounting and related subjects. Professional activities include working with professional accounting associations and other groups whose interest is accounting. Candidates should hold the appropriate doctorate or have substantially completed the degree assignments. Qualified candidates should send letters of application and resumés to: Charles Neyhart, Chairman, Department of Accounting, College of Business, Oregon State University, Corvallis, OR 97331. Oregon State University is an Equal Opportunity/Affirmative Action Employer.

#314 THE OHIO STATE UNIVERSITY has several tenure-track openings for Assistant Professors of Accounting or Management Information Systems, starting September 1985. Ph.D. or D.B.A. is required. CPA, CMA or CIA certificate desirable. Applicant must be committed to excellence in research and teaching. The Ohio State University is an affirmative action and equal opportunity employer. Applications should be directed to Prof. T. J. Burns, Chairman, Recruiting Committee, Faculty of Accounting and Management Information Systems, The Ohio State University, 1775 College Road, Columbus, OH 43210.

#315 THE OHIO STATE UNIVERSITY is looking for visiting professors (any rank) of Accounting or Management Information Systems, starting September 1985. Ph.D. or DBA is required. CPA, CMA or CIA certificate desirable. Applicants must be committed to teaching. The Ohio State University is an affirmative action and equal opportunity employer. Applications should be directed to Prof. F. P. Kollaritsch, Chairman, Faculty of Accounting and Management Information Systems, The Ohio State University, 1775 College Road, Columbus, Ohio 43210.

#316 TAX PROFESSOR—Ph.D., LL.M. (Tax), J.D. Four years teaching tax and business law courses and four years Big Eight tax experience. Write for resumé. Attending AAA convention in August 1985 in Nevada.

#317 DUKE UNIVERSITY—The Fuqua School of Business is seeking highly qualified faculty members in accounting. The qualifications required for these positions are a demonstrated interest in and capacity to do publishable research and a high level of competence in classes for MBAs and Ph.Ds. A Ph.D. degree is required. Rank and salary depend upon qualifications. Send resumé and list of references to Prof. David A. Dittman, Fuqua School of Business, Duke University, Durham, NC 27706. Duke University is an Affirmative Action/Equal Opportunity Employer.

#318 ACCOUNTING: The College of Charleston is currently searching for a visiting professor. Position is vacant for one year due to a faculty member accepting a Fulbright appointment overseas. The College of Charleston is located in the historic district of Charleston, South Carolina. It is near beautiful beaches and a thriving industrial and commercial center. Offers a congenial and stimulating environment. Ph.D. or equivalent preferred, CPA also desired. Rank and salary depend on qualifications. Send resumé and list of references to Dr. Mack Tennyson, Chair, Search Committee, Business Administration and Economics, College of Charleston, Charleston, SC 29424. Affirmative Action/Equal Opportunity Employer.

#319 CHAIRPERSON—Accounting Department, School of Economics and Management, Oakland University, Rochester, Michigan (suburban Detroit) starting Fall 1986 (or earlier). Candidates must provide leadership in academic and research programs and interact with the business and professional community. Rank and salary open and extremely competitive; outstanding fringe benefits. Candidates should be tenurable and possess a doctoral degree in accounting. Send resumés to: Ronald M. Horwitz, Dean, School of Economics and Management, Oakland University, Rochester, Michigan 48063. Oakland University is an Equal Opportunity, Affirmative Action Employer.

#320 THE COLLEGE OF CHARLESTON is currently searching for an additional accounting faculty member. The College of Charleston is located in the historic district of Charleston, SC. It is near beautiful beaches and a thriving industrial and commercial center. It offers a congenial and stimulating teaching environment. Applications for visiting professorships are encouraged. Ph.D. or equivalent preferred. CPA also desired. Rank and salary depend upon qualifications. Send resumé and list of references to Dr. Mack Tennyson, Chair, Search Committee, Business Administration and Economics, College of Charleston, Charleston, SC 29424. Affirmative Action/Equal Opportunity Employer.

#321 POSITION WANTED: Wish to relocate to a school where research in refereed journals is not required for tenure. Prefer the northeast but all inquiries will be answered. Telephone: Home (518) 561-0338 or College (518) 564-3004. Available Fall 1985.

#322 THE UNIVERSITY OF ARKANSAS will interview applicants at the AAA meeting in Reno for a tenure-track position at the assistant professor level beginning Summer or Fall 1986. While our primary teaching need is in the Systems area, we are primarily interested in adding faculty that are qualified and motivated to engage in research that leads to publication. A Ph.D./DBA or doctoral dissertation stage is required. The College of Business has AACSB accreditation for both the undergraduate and graduate programs and administers the only Ph.D. program in the state. To arrange an interview in Reno, send a resumé to: Dr. Jackson White, Department of Accounting, College of Business Administration, University of Arkansas, Fayetteville, AR 72701.

#323 CHAIR POSITION. BOWLING GREEN STATE UNIVERSITY is seeking a Chairman for the Department of Accounting and Management Information Systems starting August 1986. Candidates should have a Ph.D. (or equivalent) and be qualified for appointment at either the rank of full or associate professor. The chair is expected to provide leadership to a 26-member department offering a full range of courses in both accounting and management information systems with 1,300 undergraduate majors, a Master of Accountancy program, and heavy demand for MBA courses within the MIS area. Candidates should have a proven track record in teaching, research and service and have the ability to work with professionals in practice and industry. Salary is competitive and will depend on credentials and experience. Interested parties should submit a resumé and letter of application to Robert A. Patton, Dean, College of Business Administration, Bowling Green State University, Bowling Green, OH 43403 by February 1, 1986. Bowling Green is an Equal Opportunity/Affirmative Action Employer.

#324 POSITION WANTED: MBA, CPA, six years full-time teaching experience, three years adjunct teaching experience, sixteen years accounting and consulting experience. Teaching interests include: Principles, Intermediate, Advanced, Cost, Non-Profit and Governmental. Prefer New York City metropolitan area.

#325 OLD DOMINION UNIVERSITY. ACCOUNTING. Anticipated tenure-track assistant professor position for August 1986. Terminal degree is required but ABD with substantial progress will be considered. ODU, located in Norfolk, Virginia, is a state-supported, doctoral degree-granting university with AACSB accreditation at both graduate and undergraduate levels. Separate accounting accreditation has also been obtained. The School of Business Administration offers undergraduate programs in six areas and three graduate programs. Send applications by December 15, 1985 to: Dr. Richard Bebee, Chair, Department of Accounting, Old Dominion University, Norfolk, VA 23508. Telephone (804) 440-3529. Old Dominion University is an affirmative action, equal opportunity institution.

#326 TAXATION POSITION WANTED FOR FALL 1986. LL.M. (Tax) in process, planning to take CPA exam. Teaching business law at present. Will be at Reno meeting.

#327 UNIVERSITY OF NEVADA—RENO is seeking applications for tenure-track positions in the Accounting and Computer Information Systems Department as of July 1, 1986. Salary and rank are subject to negotiation. The positions are in the areas of (1) auditing, (2) financial accounting, (3) managerial accounting, and (4) computer information systems. Applicants should either already possess a doctorate degree or be in the dissertation stage of their doctoral programs. The University of Nevada—Reno College of Business Administration is accredited at both the undergraduate and graduate levels by the AACSB. The University has an enrollment of approximately 9,300 students and the College of Business Administration has recently moved into a new, modern building. If interested in one of these positions, please write to Professor Stephen A. Moscove, Chairman, Department of Accounting & Computer Information Systems, University of Nevada—Reno, 317E Business Building, Reno, NV 89557. The University of Nevada—Reno is an equal opportunity educator and employer.

#328 COMPUTER-ACCOUNTING POSITION WANTED: More than 15 years experience as a Division Chairman and Professor . . . CPA and CMA and recently became a candidate for a Ph.D. (ABD) . . . presented many seminars throughout the country on computer-accounting subjects . . . wrote course-software applications in Fortran and Cobol on the main-frame . . . also developed microcomputer software (templates and macros) in Accounting and Management subsystems using Lotus 1-2-3 and Symphony. Experience includes a wide range of consulting engagements.

#329 JOHN CARROLL UNIVERSITY has two tenure-track openings for associate or assistant professors with specialization in Auditing, Advanced Accounting, Taxation and Business Law at the undergraduate level. Teaching consists of twelve semester hours (3 classes, two preparations). Graduate teaching (MBA) and/or research activity reduces the normal load. No accounting classes are scheduled on Friday. Applicants should have a doctorate in accounting (CPA, CMA, or CIA certification preferred). Advanced ABDs will be considered. Persons holding J.D., CPA and Masters in Accountancy or Taxation are encouraged to apply. John Carroll is a private university (3850 students) located in an attractive residential suburb 13 miles east of Cleveland. Excellent supportive rapport with business community; funding for professional development activities is quite liberal. Salary levels are very competitive and highly supportive of research activity. In Reno please contact: Drs. Roland L. Madison, Don E. Garner, Robert T. Sullens, or Richard K. Fleischman at AAA Convention Hotel or send correspondence to: R. L. Madison, CPA, Ph.D., Professor and Chairman, Department of Accounting, John Carroll University, University Heights, Ohio 44118. Telephone: (216) 397-4404.

#330 THE UNIVERSITY OF COLORADO AT BOULDER invites applications for several faculty positions. Those openings, which are the result of retirements and new positions, begin with the academic year 1986–87. Permanent appointments are anticipated at the assistant professor level, but consideration will be given to appointment at more senior ranks for appropriately qualified individuals. Visiting appointments also may be available. Qualifications include strong research skills and interests, as well as effective teaching skills. An appropriate earned doctorate (or near-completion) is required and professional certification is desirable. Areas of interest include, but are not limited to, federal taxation (one in accounting and another to be jointly appointed in the Law School) and managerial accounting/systems. An affirmative action/equal opportunity employer, the University of Colorado at Boulder is desirous of faculty diversity and encourages applications from members of recognized minorities. The closing date for applications is November 30, 1985 or until the positions are filled. Applicants should send a current resumé together with the names and addresses of three references to: Professor L. Todd Johnson, Chairman, Accounting Division, College of Business and Administration, University of Colorado at Boulder, Boulder, CO 80309-0419.

#331 AVAILABLE FALL 1985 OR SPRING 1986. Ph.D. in accounting with many years of graduate and undergraduate teaching experience, planning incentive retirement to pursue teaching excellence at institutions in attractive locations.

#332 THE UNIVERSITY OF MANITOBA is seeking applicants for tenure-track positions in accounting at the Assistant, Associate or Full Professor levels for January or July 1986. Ph.D. (or near completion) is required. Research is encouraged and supported. A Ph.D. program is in the planning stage. Winnipeg, a multi-cultural city of 600,000, offers the best of an urban environment in the heart of Canada's vacation land. Competitive salary. For more information, contact: Dr. Nabil Elias, Chairman, Search Committee, Faculty of Administrative Studies, University of Manitoba, Winnipeg, Canada R3T 2N2; or call collect (204) 474-9362. Both women and men are encouraged to apply. In accordance with immigration requirements, priority will be given to qualified Canadian citizens and permanent residents of Canada.

#333 UNIVERSITY OF LOUISVILLE—Appointments as Assistant/Associate Professor of Accounting are available in the School of Business. Minimum qualifications for Assistant are: A Ph.D. or DBA, demonstrated potential for teaching effectiveness, and demonstrated potential for quality research capabilities. ABDs will be considered. Minimum qualifications for Associate are: A Ph.D. or DBA, demonstrated teaching effectiveness, and demonstrated quality research capabilities. Beyond minimal qualifications, preference will be given for possession of CPA or CMA. For the tax area the LLM is considered a terminal degree. If you wish to take advantage of this opportunity, send your vita to: Dr. Alan Attaway, Chairman, Department of Accounting and Commercial Law, School of Business, University of Louisville, Louisville, Kentucky 40292. An Equal Opportunity/Affirmative Action Employer.

#334 CREIGHTON UNIVERSITY, DEPARTMENT OF ACCOUNTING has a tenure-track position available. We are looking for a Ph.D. in accounting interested in teaching taxation at both the undergraduate and MBA levels. The opportunity exists to help develop new course offerings in the tax area. Basic teaching load is nine hours per semester. Summer teaching is available. The position is available August 1985. Send resumé or contact Dr. Thomas A. Shimerda, Chairman, Department of Accounting, Creighton University, Omaha, NE 68178. Creighton University is an Equal Opportunity, Affirmative Action Employer.

#335 DIRECTOR, SCHOOL OF PROFESSIONAL ACCOUNTANCY. LOUISIANA TECH UNIVERSITY. Offers bachelors, masters, doctoral programs. Doctorate, CPA, strong teaching, research experience required. Administrative experience desired. Tech has all AACSB accreditations in business and accounting. Applications by September 20, 1985 or until position filled. Dean Bob R. Owens, Box 10318, Ruston, LA 71272, (318) 257-4526. Representative will be attending the AAA meeting in Reno. Louisiana Tech is an equal opportunity university.

#336 TEXAS A&M UNIVERSITY invites applications and nominations for the ERNST & WHINNEY PROFESSORSHIP IN ACCOUNTING. Applicants/nominees should have a demonstrated record of excellence in research and teaching at the graduate level. The appointment will be at the senior level with compensation and research supplements provided by the professorship. If possible, we would like to meet with interested parties at the AAA meeting in Reno. Applications and nominations should be sent to: Professor Robert H. Strawser, Search Committee, Department of Accounting, College of Business Administration, Texas A&M University, College Station, TX 77843-4353. Texas A&M University is an Equal Opportunity/Affirmative Action Employer.

#337 COLLEGE OF BUSINESS AND MANAGEMENT: Tenure-track position(s) available September 1985; ACCOUNTING: specializations in international, managerial, computer applications; Ph.D./DBA preferred; ABD & CPA considered from an accredited university. Teaching and business experience. Rank dependent upon experience. Selection process begins May 31 and continues until position(s) is/are filled. Direct resumé, transcripts, and three letters of reference to: Dean Olga E. Engelhardt, College of Business and Management, Northeastern Illinois University, 5500 N. St. Louis, Chicago, IL 60625. AA/EOE.

#338 THE DEPARTMENT OF ACCOUNTING AND MANAGEMENT SCIENCE within the School of Business at California State University, Chico, has a faculty vacancy for a tenure-track position in the areas of auditing, taxation, and management information systems. Candidates must have a Ph.D. or D.B.A. Teaching performance, scholarly productivity, and university service record are essential attributes for appointments at advanced rank. The department offers graduate and undergraduate accounting degrees and a program in management information systems. The M.B.A. and business baccalaureate programs are AACSB-accredited. CSU-Chico is located in northern California, with outstanding summer and winter sports available. Housing costs in Chico approximate midwestern metropolitan levels. Send resumé to Dr. Lee Pryor, Professor and Chair, Department of Accounting and Management Science, California State University, Chico 95929-0011. CSUC is an Affirmative Action Employer.

#339 CLAREMONT MCKENNA COLLEGE making regular accounting appointment beginning Fall 1986, although earlier starting possible. Tax Law and/or Business Law emphasis, plus Introductory or Financial Accounting. Demonstrated interest in undergraduate teaching and scholarly research essential. Ph.D. and professional certification preferred. Rank open; salary competitive depending upon qualifications. CMC is member of Claremont Colleges. Admission highly selective; program enjoys strong support. At Reno meetings; other interview locations possible. Contact Chairman, Department of Economics/Accounting, Bauer Center, Claremont McKenna College, Claremont, California 91711. Resumé appreciated. College is affirmative action, equal opportunity employer.

#340 TEXAS CHRISTIAN UNIVERSITY has several positions available at the assistant, associate or full professor level. Qualifications for the assistant professor positions include completion or near completion of a Ph.D. or D.B.A. degree and a strong commitment to high quality teaching and scholarly research. Research support is excellent, including two-course teaching loads, summer grants, etc. Salary and fringe benefits are competitive. The Neeley School of Business is AACSB-accredited. Interested persons should contact Donald R. Nichols, Chairman of Accounting, Neeley School of Business, Texas Christian University, Fort Worth, TX 76129. TCU is an Equal Opportunity, Affirmative Action Employer.

#341 THE COLLEGE OF BUSINESS AND ADMINISTRATION AT THE UNIVERSITY OF COLORADO AT DENVER has recently been established as an independent college with 44 research-oriented faculty. We are expanding with two new faculty positions in Accounting and one in Information Systems. Applicants must have a doctoral degree in Accounting or MIS, with a commitment to excellent teaching, research publishable in leading journals, and service activities as needed to develop programs and courses. Applications may be submitted at any time and recruiting continues until the positions are filled. Rank, salary, and starting dates are competitive. Contact Dr. Bruce R. Neumann, University of Colorado at Denver, College of Business and Administration, 1475 Lawrence Street, Denver, Colorado 80202. Phone: (303) 623-4436. The University is an Equal Opportunity, Affirmative Action Employer.

#342 AUBURN UNIVERSITY invites applications and nominations for the Charles McKenzie Taylor, Jr. Professorship in Accounting. The Auburn University School of Accountancy is seeking a distinguished educator and scholar in accounting. Applicants must have an earned doctorate, professional certification and an extensive history of research and teaching. The Taylor Professor should be interested in assisting with the development of professional accounting education and in providing effective leadership in the School's research efforts. The Taylor Professor will receive a highly competitive salary, an allowance for travel and other support services, graduate student assistance, and a reduced teaching load. The search will close on September 30, 1985. The Auburn University School of Accountancy has a professional orientation and offers degrees at the undergraduate and masters levels, including the Masters of Accountancy. Auburn University is Alabama's land-grant university and largest publicly supported institution of higher education. Nominations and applications should be sent to: Dr. Robert B. Rogow, Chairman, Taylor Professorship Search Committee, School of Accountancy, Auburn University, AL 36849-3501. (205) 826-5340. An Equal Opportunity, Affirmative Action Employer.

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We would like to thank our authors in accounting, auditing and taxation for their outstanding contributions to our 1984-1985 publications.

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FELLOWSHIP AWARDS

The American Accounting Association's Committee on Fellowships met on March 21, 1985. The charge to the committee was to select the 1985-86 recipients of the American Accounting Association Grants and determine the amounts of their awards. The committee was chaired by Charles Neyhart, Oregon State University. Other members of the committee were Jose A. Gonzalez, Kent State University, and Gary E. White, Texas Tech University. AAA Executive Director Paul L. Gerhardt also attended the meeting. This year's Committee on Fellowships was the second committee to select Fellowship recipients under the Association's new Doctoral Grants Program. Under this program, only candidates entering doctoral programs are eligible and the awards only go to students in the first year of their doctoral program. The Fellowships Committee was authorized to grant up to three experimental awards in the amount of $5,000 to outstanding applicants based only upon academic merits. Other awards in the amount of $1,000 were also made. The committee selections were based upon the applicants' attributes and accomplishments and were made without distinction as to the school at which the applicant would pursue the doctoral studies. The committee reviewed sixty-one applications, which was almost twice the number received in the previous year, and granted awards totaling $30,000 to eighteen applicants. There were three $5,000 awards and fifteen $1,000 awards.

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RESEARCH STUDY #18

TRIPLE-ENTRY BOOKKEEPING AND INCOME MOMENTUM

BY YUJI IJIRI

Is double-entry bookeeping "absolutely perfect" as it has been claimed? Would it not be possible to extend it logically to triple-entry bookkeeping? If so, what would be the dimension that is destined to become the third dimension in the triple-entry system?

It is trivial to add an arbitrary third dimension and call it triple-entry bookkeeping, since if anything can appear as the third dimension, there is no room for theory, even if the resulting system is useful from a practical standpoint. The essential requirement for a solution to the double-entry problem is, therefore, that the third dimension must be logically deducible from the existing two dimensions (the debit and the credit) of double-entry bookkeeping.

In this publication, the dichotomy of the double-entry bookkeeping system is critically examined to find the logic that binds the existing two dimensions. It is then shown that this dichotomy in the existing system is in fact an imperfect subset of a natural trichotomy upon which a system of triple-entry bookkeeping can be constructed. An examination of this new system, however, reveals that it is deficient in one major aspect. This in turn leads to still a newer type of triple-entry bookkeeping which indeed extends bookkeeping from a two-dimensional space to a three-dimensional space. Some new accounts and new forms of statements are examined along with their implications to financial reporting and accountability. At the end of the publication, it is pointed out that the publication solves only a half of the double-entry problem since there remains another half of double-entry bookkeeping that seems to defy any attempt to extend it logically to a triple-entry system.

"Triple-Entry Bookkeeping and Income Momentum," a fifty-three page publication by Yuji Ijiri, is available to members of the Association for $6.00 per copy and to non-members of the AAA for $9.00 per copy.

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